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The Magazine of New Energy Technology

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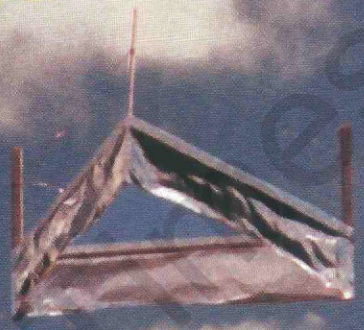
Volume 8 • Issue 45 • 2002

The "Lifter" Phenomenon



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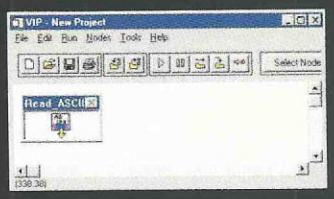

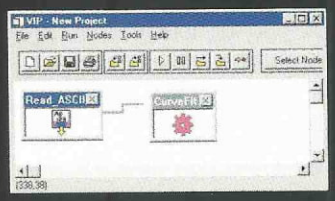

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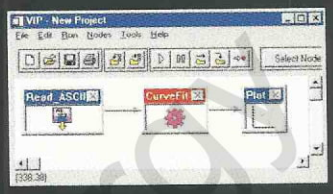

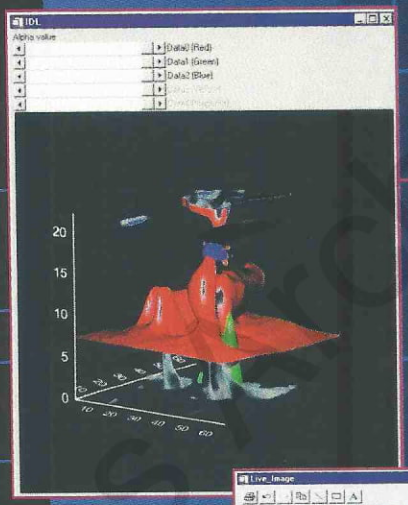

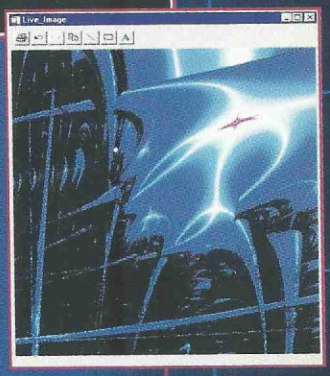

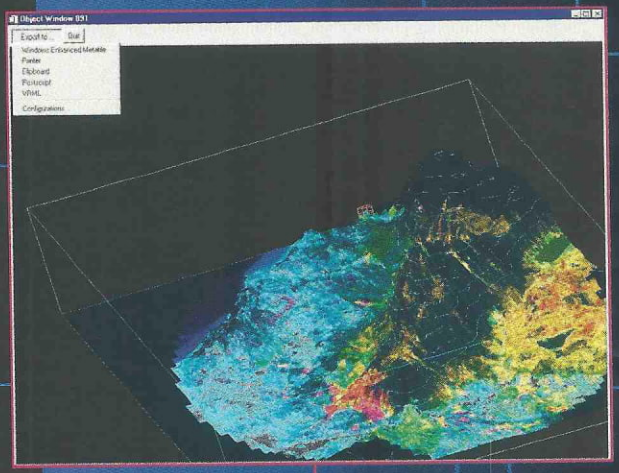

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Nicholas Longo Times Archive

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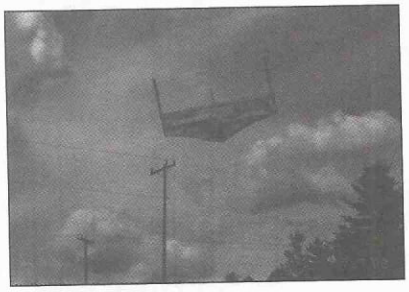

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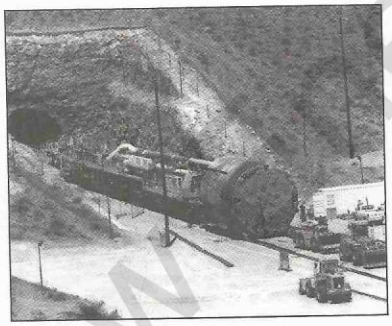

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Cover art: Barbara DelloRusso. Lifter photo by Eugene F. Mallove. This lifter is not in actual operation out-of-doors, but it is a working copy of the lifter that readers can build—see p. 20. The model shown on the cover, for effect, was suspended with nylon thread.

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Editor-in-Chief and Publisher
Eugene F. Mallove, Sc.D.

Managing Editor
Christy L. Frazier

Contributing Editors
Jed Rothwell (Georgia)
770-451-9890

Susan Seddon (U.K.)
sseddon@infinite-energy.com

Editorial Layout Manager
Joann L. Cheney

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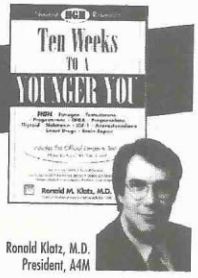

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LETTERS TO THE EDITOR

Dirac's Hole Theory

Congratulations on a particularly fine issue, No. 43, on the "death of entropy." I was specially impressed by Part 1 of D.L. Hotson's paper on "Dirac's Equation and the Sea of Negative Energy." He is surely right to call attention to the likelihood that the physics of the past century went wrong in rejecting Dirac's inspiration and thereby trifling with Ockham's rule. However, I should like to put a slightly different spin on that, by pointing out exactly what it was that Dirac proposed, before all memory of it gets swept away in the flood of progress.

Dirac's theory was a "hole" theory. That is, he pictured the ether as a "sea of negative-energy *electrons*." All (negative-energy) states of motion were filled with electrons. This described a "relativistic ether," because the filled states all "looked the same" to every inertial observer. (In any case these states were unobservable because the Pauli exclusion principle prevented their occupants from interacting with each other or with any positive-energy detector.)

When an electron in the sea was given enough positive energy to boost it into an observable state, it left behind a "hole" that was observable as a positron (absence of negative charge). This fit perfectly with pair-creation data and just used the known state-transition formalism of accepted quantum mechanics. That is, there was none of the "creation" and "annihilation" operator *ad hocery* to which Hotson rightly objects. But it is important to note the difference of Dirac's model from Hotson's proposal: Dirac pictured electrons as the only physical particles, not electrons plus positrons. Thus the asymmetry of physical abundances of observable particles and what we now call "anti-particles" was automatically explained. Indeed, there was nothing to explain, since free positrons were just rare holes or temporary absences of particles in an all-pervading infinite negatively-charged background "soup." Positrons were definitely not "electrons going backwards in time" (Feynman's embellishment). Everything was straightforward mechanics, given Dirac's weird model (which was not so weird as backwards-running time), hence logically elegant and in full conformity with Ockham.

Why was Dirac's idea rejected? Because of ideology, not because of observation. A party line developed to the effect that Dirac had started out to describe one body and had ended by describing an infinite multitude of bodies; thus his theory was "not consistent." This is nonsense, of course. His theory was no more self-inconsistent than any kind of mechanics, including Newton's. The truth is that the establishment was hot to impose field theory upon physics, by hook or crook, and to do away with mechanics as much as possible. This they did by inventing (among other oddities) a strange doctrine known as "second quantization." This involved taking the ordinary wave function of quantum mechanics and Fourier-analyzing it into harmonic components, the amplitudes of which were then hypothesized (reified) to be particle descriptors subject to the Heisenberg postulate. This was an elaborate and subtle way of dodging the obligation to treat the mechanical many-body problem in mechanical terms. In consequence, to this day physicists possess no dynamics of nuclei, because they are still using clever field theoretical dodges to avoid coming to grips with the mechanical many-body problem. We don't really know whether mechanics can cut the mustard because we have never given Dirac's idea an honest try.

What can be said about the Fourier analysis approach? Only that its practitioners are direct intellectual heirs of Claudius Ptolemy. A curve of any shape can be Fourier analyzed into harmonic components, just as the trajectory of a planet can be analyzed into epicycles. This tells an observer of normal psychology that there is no physics in it. But it does not tell professional physicists that. They are experts and know better. They have always known better and always will, in whatever reincarnations they may appear down the suffering millennia.

By my present remarks I do not wish to weaken the impact of Hotson's imaginative new departure in describing the ether. But I must point out that imagination is not the quality most conspicuously lacking from contemporary theoretical physics. What is missing is elemental respect for Hotson's first principle, "simplicity." Alas, simplicity—being a form of beauty—is in the eye of the beholder. To my eye, Dirac's hole theory (the last gasp of true mechanics and its noble tradition going back to Newton) had a simplicity that is lacking from all later attempts to mix field theory into mechanics—including Hotson's. But that is a matter of taste or esthetics.

Thomas E. Phipps, Jr.
Urbana, Illinois

Mr. Hotson Replies: I want to thank Dr. Phipps for his generally favorable response; but I must comment on "Hole Theory." I am, of course, aware of Dirac's "Hole Theory," but I omitted mention of it out of kindness to Dirac. I regard "Hole Theory" as a total disaster, a misinterpretation that caused Dirac to misunderstand his own equation. If the positron is only a "hole" in a negative energy sea of electrons alone, as "Hole Theory" and Dr. Phipps insist, then Dirac's equation has only three solutions, not four: 1) positive-energy electrons; 2) negative-energy electrons; 3) "holes" = positive-energy positrons. This is an obvious misinterpretation of the equation which, though made by Dirac himself, allowed his critics, particularly Heisenberg, to shoot "holes" in his theory.

Furthermore, I regard a "hole" with mass, charge, and spin to be an oxymoron, a contradiction in terms, which was Dr. Phipps' own objection to "curved empty space."

Again I thank Dr. Phipps for his response, though differing on the "hole."

Don Hotson
Great Mt. Falls, Colorado

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Aether and Weather Control

Judge of my astonishment when a gift copy of *Infinite Energy* revealed that an intelligent scientist of Dr. Mallove's standing not only replicated Wilhelm Reich's basic orgone accumulator experiment, but also was stating the elicited facts without any neurotic overlay. *Real science.*

Fifty years ago physicist R.H. Atkin at Cambridge (U.K.) did the same experiment with the same conclusion. "A considerable achievement" was how he described Reich's breakthrough. There is nothing complicated about the experiment. Complications arise through the character structure of the individual scientists who have difficulty tolerating the responses of their own organism to any kind of cosmic correspondence. All this is well-elucidated in Dr. Reich's clinical findings and, in my opinion, is essential to the successful management of such stellar achievements as those of the Correas. Social pathology can negate or sequester the greatest accomplishments, if they are life-positive. Bombs and napalm are okay.

Reich's daughter Eva, herself an MD, and biologist Robert McCullough, provided my introduction to the great man's work about thirty-five years ago. McCullough was Dr. Reich's assistant in the development of the cloudbuster and weather control, an activity which interested me in view of my investigation of UFOs. Back in the late 1950s, I had become convinced that the world was confronting etheric technology, and that the vehicles involved had control of their destiny so that they came from and returned to the invisible state. With an associate, I had spent a couple of years photographing UFOs in the invisible state, using infrared film and methods of our own devising. McCullough had been cheek by jowl with Reich in the most forward development of etheric weather control, and it was a landmark opportunity for me to have both his scientific counsel and his personal friendship. The cloudbuster provided an etheric focus for etheric UFOs that could be objectified photographically with its aid. Some of the UFOs proved to be plasmoidal living organisms, but that is another story, still being written by others active today in the objectification of this invisible zoo all around us.

I found out decades ago that layered boxes produced temperature differentials, as Dr. Mallove also found. There is no doubt about it. I did not know what to do with the tiny differential. Whatever its significance for physics, it was beyond my capacities and skills to use it to produce results. The cloudbuster was something else. Drastic, irrefutable influences on the weather of California's high desert with the cloudbuster soon took our attention off the ubiquitous UFOs and made us into weather engineers. From that point on, I have devoted my life to building up the basic techniques of etheric rain engineering, so that I no longer have to concern myself with those little temperature differentials.

On the contrary, I have been able to materialize and manipulate millions of tons of water in this planet's atmosphere, without the use of chemicals, electric power, or electromagnetic radiation. During twenty-six years of service in the U.S. Merchant Marine as a radio electronics officer, I had the unique opportunity to work in pristine conditions on the high seas with all of this. Miles of time lapse video tape demonstrate irrefutably that those elusive little temperature differentials of Wilhelm Reich are signatures of a massive energy source waiting to be tapped. In recent years, I have developed ungrounded translators that can be easily carried aboard light aircraft or helicopters for engineering rain. We are immersed totally in etheric force, which pulsates in us and in everything living. Accessibility is via *geometry*, bringing us back to the part of old Einstein that is correct.

Dr. Mallove and *Infinite Energy* readers might be interested in my book *Cosmic Pulse of Life: The Revolutionary Biological Power Behind UFOs*. While mainly an account of my own exploratory adventures chasing UFOs, Dr. Reich is membered properly into the format along with two other titans, Dr. Ruth Drown and Dr. Rudolf Steiner.

Any man with a doctorate willing to say publicly that Wilhelm Reich was right about the ORAC must have an open mind!

Trevor James Constable
San Pedro, California

The Ultimate Infinite Energy Machine

What do you suppose would happen if the helium of Clarence Skinner's electrical discharge experiment[1] was replaced with argon, whose second ionization energy of 27.63 eV is just what the doctor ordered for converting hydrogen atoms into hydrinos by a resonant energy transfer?[2]

Would the corresponding increase in plasma energy show up? And if a heated strontium cathode were to replace Skinner's cold cathode, would an additional energy release be even more apparent? Such an energy device, if successful, would be the ultimate infinite energy machine; even though the quantity of energy might not reach a practical level by Earth standards, still the experiment could prove useful in quantifying the density and mobility of the ether's hydrogen environment.

Charles Stuart
Titusville, Florida

References

1. Rowe, P.E. 2002. "Light, Gravity, and Einstein's Twin Paradox," *Infinite Energy*, 7, 42, 65-68.
2. Mills, R.L., Nansteel, M., and Ray, P. "Argon-Hydrogen-Strontium Discharge Light Source," www.blacklightpower.com.

Addendum to Paper

In my paper in *IE* #43 ("Enhancement of Cold Fusion Processes in Palladium by Catalytic Agents"), I pointed out that the fusion of lithium 6 and a deuteron to form a pair of alpha particles could be enhanced by free neutrons. Let me now suggest that the fusion of a pair of lithium 6 nuclei to form three alpha particles can also be enhanced by free neutrons. Consider the following reactions:

$$^{3}Li^{6} + n \rightarrow {}^{1}H^{3} + {}^{2}He^{4} + 4.78 \text{ MeV}$$
$$^{3}Li^{6} + {}^{1}H^{3} \rightarrow n + 2\ {}^{2}He^{4} + 16.12 \text{ Mev}$$

The free neutron is not used up in the reactions. The net result is equivalent to

$$2\ {}^{3}Li^{6} \rightarrow 3\ {}^{2}He^{4} + 20.90 \text{ MeV}$$

Note that no deuterons need be present. This may be the preferred reaction in George Miley's work involving an electrolyte of lithium sulfate and light water.

Robert Parmenter
Tucson, Arizona

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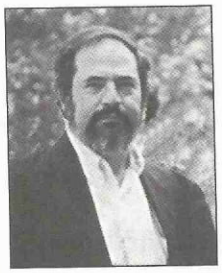
A Matter of Gravity

by Eugene F. Mallove, Sc.D.



Antigravity has been an enduring concern of human beings, long before Isaac Newton in the 1680s proposed there was even such a thing as "universal gravitation" between every two pieces of matter in the cosmos. Newton was first to express the magnitude of this all-pervading force with the simple formula, $F = GmM/r^2$, which relates the force to the masses that are gravitating (m and M) and the distance, r, between their centers. Long before there were airplanes—the most common "antigravity" machines of today—there were flying birds and insects, arrows and bullets that could be sent high, stones and spears that could be thrown upward, and soaring firework rockets. None of these actually escaped gravity's clutches, of course, all being destined to fall back or land on the ground. This "antigravity" was indeed fleeting.

Human beings wondered, no doubt for thousands of years, whether they could ever have the kind of temporary antigravity common to most birds. Could we learn how to fly? The very century that finally gave us heavier-than-air flight (after decades of dogmatism by many scientists that it would remain impossible) also delivered orbital spaceflight. That feat, achieved by the Russians in October 1957, had been proposed by Sir Isaac himself—his famous high-velocity cannonball fired horizontally from a mountaintop. Combining what Sir Isaac knew and advanced rocketry, humanity has haltingly begun to explore the wider universe. But. . .is there a better way? Could there be a "real" antigravity, something that wouldn't be fleeting, something that would last—like a gravity shield or a method to cancel or reduce gravity's bonds?

Apart from accounts in science fiction stories, our most recent encounter with *perhaps* genuine antigravity (or gravity "shielding" at least) was the rotating superconductor "gravity shield" of Eugene Podkletnov (who worked in Russia and Finland), a story which broke in 1996 and even rated a full page in *Business Week* (September 30, 1996, p. 42). *Infinite Energy's* Christopher Tinsley wrote a haunting piece about this experiment and its extensive theoretical precursors, "Table Top Antigravity?," for *IE* #9 (July/August 1996). The Podkletnov magnetically levitated superconductor was alleged to produce on the order of 2% to 5% weight reductions in a vertical zone several meters above it. The inimitable Tinsley even chose to quote the infamous Prof. Frank Close, a scurrilous anti-cold fusioneer ("who was not frank and not even close" about cold fusion, I say). Paraphrasing and quoting Close from a BBC/The Learning Channel production of that era, Chris wrote: "He said that possibly antigravity is closer to science fact than one might think, and that in some theories gravity had two components—the one with which we are familiar, and a 'little bit on top, which is like antigravity.'" In this instance, Close may have been a lot closer to the truth than he could possibly know! Read on. . .

Predating Podkletnov on the serious antigravity scene were Japanese scientists H. Hayasaka and S. Tackeuchi, who published an extraordinary article in the mainstream journal *Physical Review Letters* (Vol. 63, 1989, p. 2701). They reported that a rotating flywheel, spinning about a vertical axis in vacuum, experienced a small weight loss that was directly proportional to the rotation speed. The effect was observed only for rotation clockwise (as seen from above in their northern hemisphere laboratory). As with the parallel physics heresy that emerged in 1989—cold fusion—the Japanese anti-gravitational effect was buried in an avalanche of apparently rushed criticism and inadequate or flawed counter experiment. Unlike cold fusion, however, there arose no widespread community of dedicated investigators and supporters of the positive result, so the controversy has been quite removed from public view. Our esteemed scientific advisor Dr. Harold Aspden, however, took it upon himself in 1989 to write a most rewarding paper, "The Theory of antigràvity," published in *Physical Essays* (Vol. 4, No. 1, 1991, pp. 13-19). In his view, the rotational antigravity effect (if real) was probably the expected effect of vacuum medium, *i.e.* ether, spin. Aspden wrote:

> The fact that the lift force depends upon the direction of spin is a clear indicator of the asymmetry arising from charge displacement. The author's theory of the vacuum field in terms of synchronous lattice electrodynamics specifies that there is a preferred spin direction in the vacuum. An action conductive to vacuum spin will displace electric charge radially outwards or inwards according to the orientation of the spin axis relative to the preferred direction. However, such displacement must be balanced by charge displacement in matter, and electrons can flow outwards in a conductive flywheel to sit just outside the vacuum region in spin, but positive ions cannot be so displaced. Accordingly, the coextensive rotation of the vacuum medium within a flywheel can only occur readily for one direction of spin, that which corresponds to the rotation of the Sun and all the planets.

Aspden was able to calculate a rough correspondence from his ether theory with the weight loss function of angular rotation found by the Japanese investigators. Aspden's article covered much more ground, however, than the Japanese experiment and its interpretation. He delved into the observations of

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unexplained anomalies in simple flywheels that were introduced by the late Eric Laithwaite at London's Imperial College of Science and Technology. This issue of macroscopic "antigravity"—or perhaps more properly termed "mechanical reactionless thrusters" that are alleged to be in violation of Newton's Third Law (of action equaling reaction)—is a gigantic topic and controversy in its own right. It involves such figures as Robert Cook, whose thruster has been tested with some success at Boeing (see *IE* #28 and #29) and many others from Norman Dean of "Dean Drive" fame in the 1960s to B. Thornson.

A little known background to this antigravity matter in the mainstream and not-so-mainstream is physicist Robert L. Forward's discussion of *Newtonian* antigravity. Yes, in principle it is quite possible to achieve an antigravity zone using matter itself! In his imaginative book, *Future Magic: How Today's Science Fiction Will Become Tomorrow's Reality* (Avon Books, 1988), Forward notes that if a suitably dense mass (white dwarf-star density—about a million times greater than normal densities!) could be supported at Earth's surface (with columns of diamond strength or greater), the opposing gravitational attractions between the super-dense mass and Earth's gravity field would produce a zone of zero-gravity under it. Forward calculated that a disc-shaped mass 45 cm in diameter and 10 cm thick, supported horizontally on Earth, would produce a zone of cancelled gravity underneath. Immediately above the disk would be a 2g downward field. Technologically difficult as this would be, it establishes something like an existence proof for antigravity. Forward also suggests using super-dense neutron-star-like fluid circulating in coils to produce antigravity (under what I regard as the very hazardous assumption that Einstein's General Theory of Relativity is a valid description of nature). Clever as these ideas are, they are beset with the same problem that confronts the hot fusioneers and their non-working tokamaks. The solution to the problem of fusion is table-top and it is here already in prototype experiment form. The easy solution to antigravity is also table-top, and it too is here, albeit marginalized and ridiculed.

We come to the fascinating "lifter phenomenon," the subject of lengthy hands-on, build-one-yourself discussions elsewhere in this issue (see pp. 13-29). These conceptually simple "asymmetrical capacitor" devices (which NASA has just now patented!) certainly oppose gravity in their high-voltage-derived working. Hence, they are "antigravity," in that sense, just like airplanes. These all have parentage in the patented devices of remarkable American inventor Thomas Townsend Brown (1905-1985). However, simple as these are, there persists deep confusion and controversy about what precisely produces the thrusting effects, which can support more than the weight of the lifter itself. Furthermore, it is clear that thrusting occurs in horizontal orientation too. So, unlike Podkletnov-like claims, this is not purported gravity "shielding."

There have been unsuccessful attempts to correlate the lifter thrust with the admitted ion wind entrainment when these thrusters operate in air. Said ion wind seems to be a very small fraction of the total thrust effect, many have concluded by calculation and experiment. And, there are other asymmetrical electric field-type thrusters, such as the Jean-Claude Lafforgue device, which received French Patent No. 2651388 in 1991, "Isolated Systems Self-propelled by Electrostatic Forces." Testing by Jean-Louis Naudin, reported on his excellent site (http://jnaudin.free.fr), seems to confirm that ion wind is not the thrusting mechanism for that device (see also www.americanantigravity.com). The thruster of Hector Serrano of Gravitec, Inc. is in that lineage and was granted international patent WO 00/58623, "Propulsion Device and Method Employing Electric Fields for Producing Thrust," October 5, 2000.

My urgent suggestion to NASA is simply this: On the next space shuttle flight out (Hah, fat chance!), carry up a half-dozen versions of T.T. Brown devices, asymmetrical capacitors of recent vintage (inspired by the Transdimensional Technologies design), and Lafforgue and/or Serrano devices of recent vintage (NASA, please see photo on our cover for blue-sky inspiration!). On orbit, sequentially deploy each device, equipped with its own power supply outside the shuttle, and watch its movement. If it begins to accelerate away from the shuttle in the vacuum of space—fast or ever-so-slowly (because of the mass of the power supply)—we have reactionless thrusting *proved* once and for all! Not much "ion wind" out there. (Yes, some vacuum chamber tests on terra firma have been done, but these are still mired in controversy—one doesn't get a straight story.) But this would be much too simple (and cheap!) for NASA, which prefers to squander tens of millions on "gravity probe" tests of General Relativity and other probable mythologies.

Finally, we must confront a much more serious antigravity matter. What if antigravity were very common and universal, much more simple even than the asymmetrical capacitors seem to be? What if antigravity were right under our very noses, and we had been too mesmerized by the Fizzix Establishment to notice it? Well, ladies and gentlemen, it almost certainly is! Regular readers of *Infinite Energy* know that this editor has spent a great deal of time studying the exemplary work of Dr. Paulo and Alexandra Correa, of Toronto, Canada. If on their site, www.aetherometry.com, one reads my 2001 "Letter of Support," one will find my description of an anti-gravitational experiment that they performed for me in late August 2000 in their lab. A 43 milligram piece of gold leaf, which was suspended by a dielectric thread from the arm of a wooden beam connected to a sensitive electronic balance (far off to the side), was quickly reduced in apparent weight by 70%.

Now, this is, in gross "antigravity" performance, not as good as the "lifter phenomenon," but note well that there were *no* electrical connections whatever to the suspended foil, merely the imposition of an electrical frequency between distant (from the gold leaf) metal plates adjusted to match that of the corresponding gold "anti-graviton," as the Correas would call it. There were no ion wind issues in that experiment. And, the result is far, far more profound than the baroque claims of Podkletnov *et al.* are—with their rotating HTSC superconductor plate that NASA and other labs have still apparently failed to confirm. I honestly bless the HTSC antigravity people for trying to do good science amid the ignorant protests of Robert Park and his *Voodoo* scientist ilk, but this HTSC antigravity approach does not get to the core of what gravity, and anti-gravity, may really be.

It turns out that the common gold leaf electroscope, sitting in virtually every high school lab, may be a perfect tool to investigate anti-gravitation. This is a much larger topic than can be covered in this very brief space (I promise a future article devoted to just this topic), but a close reading of the Correa scientific monographs posted on www.aetherometry.com

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leads to the profoundly unsettling conclusion that a component of the aether that they have identified (its "latent heat" component) is constantly performing antigravitational work on the moving electrons in the foil to keep the gold leaf supported, even when said leaf is in "static" position—held apart *allegedly* by only the static repulsion of the imposed charge (or so conventional "static electricity" theory would have everyone believe). Yes, if the Correas are correct, electroscopes may be exemplars of antigravity at work. They are apparently "perpetual motion machines" too. Energy is conserved, of course, but there is continuous expenditure of aether energy that goes into just holding those leaves up, the Correas propose. Professional skeptics will of course not devote one minute to the difficult study or experimentation with such claims, preferring quick, glib dismissive remarks that suggest the topic is off limits to rational investigation. Too bad for them.

The only problem with such a stance is that aether motors (apparently self-running, from a mass-free aether energy component) have been built and shown hands-on to over a dozen individuals. Embedded in the operation of such motors is the deep connection between electricity, gravity, and nature's antigravity. At the Innovative Energy Technology conference in Berlin (June 13-15, 2002), the Correas showed an excellent video tape of such aether motor operation and distinguished their characteristics from their earlier patented PAGD (pulsed abnormal glow discharge) motor work, as well as from Wilhelm Reich's "orgone" motors in the 1950s (which were not claimed to be self-running). The groundwork for the science of such motors is already publicly available. Perhaps more technical details of the motor construction will be made available too; website space has been allocated for that, one can verify from their outline. Patents have been applied for and are in process. On a shorter timeframe, it is likely that the one-hour video presentation for the German conference, which I have previewed, will be made available commercially.

The effects of antigravity and its direct link to freely available energy, via the long-sought *experimentally verifiable* connection between electrical phenomena and gravity, will eventually become common knowledge. But, most certainly, not without a great fight. Science killers like Voodoo Park and his groupies are out there to destroy novel science at every turn—". . .claims of antigravity devices seem to come up every few years, only to fade away in a matter of weeks or months. . ." (p. 138, *Voodoo Science*). Park and kindred dark spirits intuitively understand the free energy implications of antigravity. They have reason to fear it. They can hold it back, but they can no more stop it than the light of day. ❑❑❑

BREAKING NEWS! Please see page 68

New COLD FUSION Website

http://LENR.org

A resource for cold fusion researchers and students.
A growing archive of original cold fusion technical papers.

UPCOMING EVENTS

The American College of Orgonomy

Premiere of "Room for Happiness"

A documentary film depicting the modern face of medical orgone therapy, pioneered by Dr. Wilhelm Reich, the first physician to understand the mind-body connection.

Cocktail Reception and Annual Dinner

Saturday, October 19, 2002
The Ritz-Carlton, New York City

To register call (732)821-1144
Visit our website at www.orgonomy.org

Conference on Energy and Accountability

The Ethics of Innovation, Suppression, and Crisis

November 9-10, 2002
Holiday Inn
College Park, MD

For more information visit our website:
www.integrityresearchinstitute.org
or e-mail us: iri@erols.com

ICCF10 Scheduled for 2003

The 10th International Conference on Cold Fusion has been scheduled for August 24-29, 2003, at the Royal Sonesta in Cambridge, MA.

Watch *Infinite Energy* and its website for information as it becomes available.

www.infinite-energy.com

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The Fantasy of YUCCA MOUNTAIN

Richard Shamp*

Apparently the final decision has been made to store our nuclear waste under Yucca Mountain in Nevada. The decision was made by the Department of Energy (DOE), approved by the President, has been passed by the House, and in early July the Senate voted its approval. This approval has been made despite negative recommendations by government commissions, GAO, private companies, and individuals. The governors of at least two states, Nevada and Utah, have both voiced very strong protests.

The first problem, although not the most serious, is the cost. It is estimated that the cost to date for the structure has been between $6-8 billion. The House Energy Committee recently overwhelmingly approved $58 billion for the complete construction of the facility. There is also another site on the Goshute Indian Reservation in western Utah on which another disposal site is planned (cost unknown). Transportation of the waste to Yucca Mountain has been estimated by government agencies to cost between $8-10 billion.

Many unsolved problems exist at the Yucca site. The computer models that the DOE used to access the site are riddled with uncertainties.[1] The Nuclear Regulatory Commission (NRC) recently identified 293 unresolved technical issues, some of which are the faulting and fracturing of the repository rocks. The seepage of water through heated rocks will corrode storage canisters. The water table is different than originally thought; there have been ten earthquakes in the last ten years, creating much faulting in the rocks. The location is astride a major fault line. Additionally, the soft tuff rocks contain much more water than originally thought.

John Bartlett, an engineer who headed the DOE project from 1990 to 1993, said that the proposed rock formations were found to be "far inferior to that originally expected" in terms of preventing contamination.[2] DOE officials strongly disputed Bartlett's assertion. The DOE's response has been to shift its reliance almost totally to man-made canisters, an emphasis that undermines the remote mountain burial site in the first place. Why even transport it to Yucca if the canisters are safe?

The DOE has virtually ignored the risks of transporting deadly waste through 43 states. Fifty million Americans live within one mile of the route. Transporting nuclear waste magnifies the possibilities for a terrorist attack. According to the *Washington Post*, more than 100,000 truckloads of highly radioactive waste will travel through 43 states for a period of 40 years, just to dump the 77,000 metric tons of existing high level nuclear waste.[3] Every one of these shipments is a potential target for a terrorist.

Another estimate shows that more than 40,000 tons of spent nuclear material (non-weapons grade) are stored in 131 facilities in 39 states and 161 million Americans live within 75 miles of these sites. A DOE map of proposed train shipments includes 312 shipments along CSX tracks that run under Washington, D.C.'s L'Enfant Plaza, only blocks from the U.S. Capitol.[4] Many nuclear power plants lack rail connections, which means the waste must be shipped by trucks in smaller quantities, along major highways through most states.

Dario Herrera, of the Clark County Commission of Reno, Nevada, states that "studies show the cost to Clark County Public Safety agencies to prepare for the shipments is expected to exceed $360 million. Other costs to the public could reach $2.7 billion over the proposed 40 years of shipment."[5]

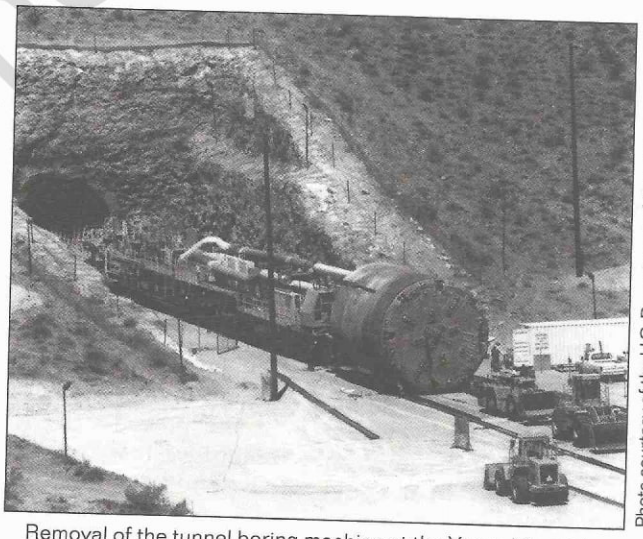

Photo courtesy of the U.S. Department of Energy.

Removal of the tunnel boring machine at the Yucca Mountain Exploratory Studies Facility (south portal).

Every state, city, town, and village crisscrossed by this transportation of nuclear waste will be filing claims. Can't you see the tort lawyers' mouths watering on the hundreds of suits that will be filed? Peter Angelos, the owner of the Baltimore Orioles, will be able to buy two baseball teams with his fees from the state of Maryland (as he

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ANS Position Affirms Safety of Transporting Nuclear Waste

ANS Press Release, July 12, 2002—With the Senate approving Yucca Mountain as the nation's first geological repository on Tuesday, attention now focuses on the security of moving spent nuclear fuel to the Nevada site. The American Nuclear Society (ANS) has adopted a position statement that addresses the safety of transporting radioactive materials.

ANS applauds the Senate's vote approving Yucca Mountain.

"The transportation of radioactive materials in the U.S. has enjoyed, and can continue to enjoy, an excellent safety record," said Herb Fontecilla, chair of ANS' Public Policy Committee. "In view of this safety record, the small number of shipments compared to the volume of other hazardous materials, the inherent robustness and stringent requirements imposed on the shipping casks, we believe that the projected shipments of used nuclear fuel to Yucca Mountain can be accomplished safely and without impacting the health and safety of the population along the shipping routes."

Operation of Yucca Mountain for used nuclear fuel would result in additional shipments from reactor sites, where the fuel is currently stored. Current estimates are for about 2,200 truck shipments and 500 rail shipments per year over a 24-year period. This would constitute an increase of less than 0.1% over the current number of radioactive shipments, and less than 0.0007% of the 400 million shipments of all kinds of hazardous materials taking place per year in the U.S.

The nuclear energy industry has transported more than 3,000 shipments of used nuclear fuel over 1.7 million miles of U.S. highways and railroads since 1964. No nuclear fuel container has ever cracked or released any radioactive material to the environment. Also, the Department of Energy has transported to the Waste Isolation Pilot Project in New Mexico about 700 shipments of transuranic waste over 1.5 million miles since 1999 without incident.

"All shipments of radioactive materials take place according to regulations issued by the Department of Transportation and the Nuclear Regulatory Commission," said Fontecilla. "Federal regulations address packaging, labeling, loading and unloading, storage, transportation routes, and vehicle requirements, as well as limits on external radiation.

"There also are requirements to protect against the diversion of these materials. All shippers and carriers are licensed, as are the storage and shipping containers."

Packages, or casks, used for the transportation of materials with the highest levels of radioactivity—including used nuclear fuel—are required to survive such simulated accident conditions as a crash at high speed into a concrete barrier, water immersion, a 30-foot drop onto an unyielding surface, severe impact, and extreme heat. Studies of the risk posed by the transportation of used fuel confirm that the current regulations provide adequate protection of the public health and safety, according to the ANS position statement. In addition, used fuel shipments take place only along specified routes, and governors of states through which the material will pass are notified in advance.

"More than 45 million shipments of radioactive materials have taken place in the U.S. over the last three decades, with a current rate of about three million per year," said Fontecilla. "The majority of these radioactive shipments consist of radiopharmaceuticals, luminous dials and indicators, smoke detectors, contaminated clothing and equipment, and research and industrial sources. Fewer than 3,500, or 0.01%, have been involved in any sort of accident, incident, or anything other than routine transportation. Fewer than 200 were damaged or failed in any form.

"None of the damaged packages contained used fuel or high-level radioactive materials."

ANS, established in 1954, is a professional organization of scientists and engineers devoted to the applications of nuclear science and technology. Its 11,000 members come from diverse technical disciplines ranging from physics and nuclear safety to operations and power, and from across the full spectrum of the national and international nuclear enterprise, including government, academia, research laboratories, and private industry.

For more information regarding this and other position statements of the ANS, please go to its website at www.ans.org/pi/ps/.

did on the tobacco settlement).

If Yucca Mountain proceeds on schedule, it would be 40 years before the waste is all in Nevada. This is assuming no more waste is produced during this period.

All of the data referred to above does not approach the main problem involved with the storage of nuclear waste at Yucca Mountain. At the heart of the issue is the unresolved set of problems associated with the catastrophic failure of materials used to contain highly toxic heavy ion nuclear waste material. The issues related to the neutron embrittlement of containers are not addressed in any government information releases and are seldom referred to, much less discussed in cogent detail.

The half-life of many of the most potent and therefore dangerous materials is estimated by Argonne National Laboratories at something in the neighborhood of 1.5 billion years. Other materials have been shown to demonstrate varying rates of half-life decay ranging from 250,000 to 10,000 years. The press releases and pronouncements issued by the DOE and the NRC almost always focus on the shortest half-life cycles during debate related to the encapsulation of such materials. I have seen no reference in the press to the longer half-life cycles of the most potent waste materials in any recent articles related to the advisability of burying them under the ground at Yucca Mountain and on the Goshute Indian Reservation.

The process of neutron embrittlement is not conceptually difficult to describe or understand. When highly reac-

tive nuclear fuel materials are enclosed in zirconium fuel rods or dissolved in solution, the principal nuclear material emitted to produce heat, light, and other related effects are neutrons. Neutrons are heavy particles which are emitted at very high velocities. The materials are packed into zirconium fuel rods, because zirconium demonstrates a unique characteristic among all the metals. The material is essentially transparent to the neutron emissions. The reason the fuel rods, have to be taken out of circulation periodically and replaced with new ones is not because the fuel material gets used up. Instead, the transparency of the zirconium to neutron emission eventually becomes hampered because the continuous bombardment of the fuel rod material by high velocity neutrons atomically alters the crystalline structure of the fuel rods themselves. Instead of allowing the neutrons to pass into the surrounding water and graphite materials, where heat is generated to produce steam to drive the turbines, etc., the fuel rods themselves become very unstable and dangerous. When the fuel rods can no longer allow neutrons to pass to the outside environment, the danger of fission criticality becomes sufficiently compelling to require that the fuel rods be removed from the nuclear pile and stored in water.

The neutron embrittlement process has been conclusively shown to be irremediable—that means no material yet devised by human ingenuity can be relied on to effectively resist it. At Argonne National Laboratories, the most advanced ceramic "glassine" encapsulation materials have been shown to lose their viability as containment barriers in much less than 1,000 years, in the presence of the kind of heavy ion nuclear waste materials stored at the DOE's Savannah River nuclear waste dump. The result of this work is not available to the general public. It suggests that all of our fears regarding the long-term effects associated with burying nuclear waste are well-founded.

Even in the case of low-grade materials with a half-life of 10,000 years, it is likely that catastrophic containment failure can be expected before less than 10% of the material's half-life decay cycle has been completed. It can be estimated that the best of the current storage containers may last between 50 to 100 years. The degree of contamination which could be reasonably expected in such an event surpasses even the most malignant assessment. . .it is simply suicidal to even consider the option.[6]

While all of the above is fairly negative, there is a *probable* solution that would solve many of the problems that exist with the storage of nuclear waste at Yucca Mountain.

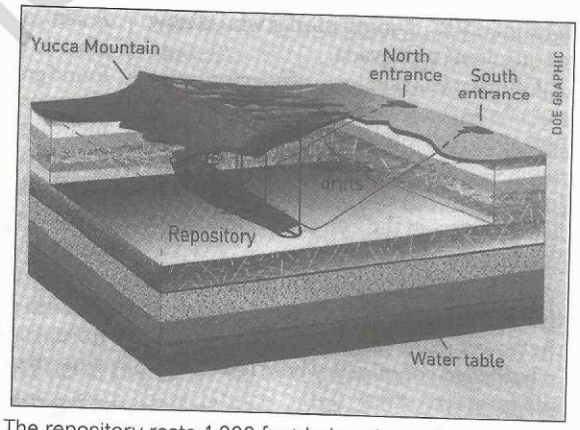
In recent years, a group of scientists in the U.S., working in conjunction with their colleagues from China, the EEU, and CIS have developed a new technology which is referred to in the literature as Soliton Ion Acceleration (SIA).

The newly-emerging family of technologies has been peer-reviewed, tested, and demonstrated under carefully controlled laboratory conditions, and verified by independent test labs around the world. The body of literature developed over the past ten years, embodied in more than 4,000 papers and studies published in peer-reviewed journals by more than 150 teams of scientists, demonstrates conclusively that this technology can be reliably and safely used to remediate radioactive emissions from low-level emitters such as thorium, in both solid and liquid forms. Scientists engaged in developing this technology are optimistic that the techniques will work with equal facility when applied to higher level materials, such as plutonium, cesium, iodine, and other similar materials. However, they have thus far been unable to fully test their hypothesis since the necessary facilities (hot labs) are well beyond the level of private capitalization which has been made available thus far. Much more is known about this process than was known about nuclear fission as an entire class of phenomena when the Manhattan Project was started in the early 1940s.

The concept of SIAs began with work originally conducted by scientist Ken Shoulders of Bodega Bay, California. On May 21, 1991, Shoulders was awarded U.S. patent 5,018,180 by the U.S. Patent and Trademark Office for his invention, which was entitled "Energy Conversion Using High Charge Density." In his patent, Shoulders claims that a highly charged burst of electrons can be created under controlled conditions, assuming a form which would remain stable long enough to enable investigators to direct them deliberately into target materials with predictable results. His technology relies on a voltage which is 10^3 (1,000) times less than that used in a typical high velocity particle accelerator. Since electrons are much lower in mass than protons or neutrons, much less energy is required to accelerate them to significant velocities (10% of the speed of light) towards a target.[7] Further, his research shows that the average speed of high density electron SIAs is measured in the neighborhood of one-tenth the speed of light, rather than 40 to 60% C, as reported in particle accelerator experiments using protons.

After nearly a decade of independent research by such luminaries as Dr. Hal Puthoff,[8] Moray King,[9] Professors Ilyanuck[10] (Belarus) and Mesyats[11] (Ukraine), Dr. S-X. Jin[12] (China/U.S.), and others, it was discovered that SIAs exhibit some extremely peculiar properties. Among other things, it was discovered that the SIAs being generated in laboratories in the U.S. exhibit a toroidal (smoke ring) shape measuring 1 micron (one-millionth of a meter) in diameter, while those used in Belarus measure 20 microns. SIAs generated by Chinese scientists are reported to measure 50 microns.[13] It was not until August 1998, when Dr. S-X. Jin was able to complete the mathematical formulation which describes the dynamics which operate in SIAs, that we were able to understand why this phenomenon occurs.

At the Institute for New Energy symposium held at the



The repository rests 1,000 feet below the surface and midway between the mountain's peak and the water table. Some 70,000 metric tons of waste will be placed in 35 miles of tunnels and actively monitored for as long as 300 years. Some five miles of tunnels, have been bored for experimental purposes so far.

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University of Utah in August 1998,[14] Jin delivered a paper which described the quantum mechanical forces which operate to form electron SIAs. The incremental diameters observed and measured by three distinctly different labs resulted from variations in current/voltage being applied, variations in the materials used to form the probe/cluster generator devices, and variations in the gaseous/liquid environments in which the SIAs were being propagated. The Jin formulation predicted this result, described with unequivocal clarity what was happening, and explained this phenomena for the very first time.

A budget of less than $10 million over a period of less than 24 months would be sufficient to validate and take this new technology to a commercial basis. This amount would allow the development and production of a system that could be used on *every* site where there are nuclear waste problems, including but not limited to Hanford, Savannah River, Idaho Falls, nuclear power plants, etc. The cost of a remediation unit, once developed, is estimated to be $3-5 million. The unit would be portable and could be taken from site to site. This would eliminate all the problems of transporting nuclear waste from hundreds of sites. This same technology could be used around the world to get rid of nuclear waste and to destroy all high-level sources of radioactivity, such as plutonium used in bombs.

In order to eliminate or at least minimize these problems, I would like to propose the following: The Yucca Mountain facility should be paired with a mandate for a Nuclear Remediation Technologies Evaluation (NRTE) program. It is very important that this facility be chartered to look at innovative ideas from around the world and allow techniques to be evaluated on both low-level and high-level nuclear materials. The work of these scientists gives much hope to the development of low-cost nuclear remediation techniques that should not be lost with the opening of the Yucca facility.

I would like to see the NRTE program be a complement to the current Yucca Mountain program. I realize that the government agencies cannot wait forever to take action while all these problems are solved. Storage will not begin for another five to eight years. In the meantime, a solution may be found in a concurrent NRTE program, making a majority of the existing problems disappear. It would give a home to the proponents of nuclear remediation ideas and perhaps provide an environmental offset to the controversy over the facility.

I would suggest that the facility not duplicate the existing "Big Science" approaches, such as spallation nuclear accelerators for transmutation or new ceramic encapsulation techniques. The focus should be on the body of knowledge developing under the heading of Low-Energy Nuclear Transmutations (LENT). There are now many hundreds of successful and thought-provoking observations coming from this area that need to be understood. The goal of NRTE would be to truly determine if we are missing any techniques that may quickly solve our nuclear waste problems and nuclear waste storage problems. The cost would be so minimal compared to the cost of storage and transportation of nuclear waste in Yucca Mountain and the billions spent on fission technology, that it would be unforgivable not to give it a try.

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About the Author

Mr. Shamp received a bachelor's degree in chemical engineering (major in geology) from the University of New Mexico. He was a Lt. Commander in the U.S. Navy. He worked for Navy Intelligence, Air Force Intelligence, and the CIA in Washington, D.C. For the past thirty years, Mr. Shamp has been a consulting engineer in the fields of oceanography, the environment, and nuclear engineering. He is a past president of the Marine Technology Society.

*Nuclear Remediation Technology, Inc., 5807 36th Avenue, Hyattsville, MD 20782
Phone: 301-559-5057; Fax: 301-559-0122

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The "Lifter" Phenomenon:

Electrogravitics, Antigravity, and More

Eugene F. Mallove

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Introduction

All over the world, a strange hobby is gathering force—the making of cheap, lightweight craft of aluminum foil, balsa wood, and thin wire, which "thrust" themselves silently upward in defiance of gravity. The model airplane-type structures, superficially resembling triangular kites, have no wings, propellers, or moving parts. Indoors or out, the craft leap upward against nylon tethers that *hold them back* from zooming ever higher!

The "power" source for such craft? Nothing more than a ground-based high-voltage power supply (30,000 volts and above)—often scavenged by tinkerers from old computer monitors. The internet-linked hobbyists compete to see how much *mass* (actually, *weight*) of payload (now in the several grams range) their "lifters" can carry. They proudly display their new designs and accomplishments in internet images and video clips; consult the several websites referenced to view the videos and the original material.[1]

Even more amazing about this space-age hobby: *There is no clear, generally accepted physics explanation about how these craft work!* In electronics terms, they are *asymmetrical capacitors* (one side or electrode holding more charge than the other) onto which charge has been applied from a DC source. There is an unmistakable force generated that makes these craft experience movement in the direction toward the smaller-sized electrode. The "skeptics," of course, have the usual knee-jerk reaction that this odd phenomenon can be explained very simply. They contend that the craft are simply imparting motion to ionized air molecules and are thus relying on jet thrusting action of propelled mass, *i.e.* it's just "ion wind." But some (not all) experiments, and *all* calculations of the "ion wind" explanation that I have seen, find it quite insufficient (by orders of magnitude, depending on the assumptions) to explain the "antigravity" thrusting. Are these lifters then, in part, "reactionless thrusters," or are they manifesting, in part, genuine antigravity effects?

Know well that some of these lifters have been turned 90-degrees and used in pairs to thrust horizontally about a shaft, creating an interesting motor effect. (What are the energetics and ultimate efficiencies of such motors? These are interesting and important questions, to be sure.) It is not possible to say one way or the other how lifters work their magic—and that is part of the excitement and charm of this area. This is a field ripe for open-ended experimentation and development of products.

Bear in mind that the conditions and parameters of individual experiments are very important—firm conclusions about physics cannot be drawn from a single isolated experiment, no matter how carefully done. What is the voltage level, degree of asymmetry of the capacitor, orientation, steady DC power vs. pulsed DC power, etc.? It may well be, for example, that the truly interesting physics emerges only at higher voltage levels; there is evidence of that in the historical record of "electrogravitics"—Thomas Townsend Brown's work (see below)—from which this field emerged.[2]

T.T. Brown, 1905-1985.

Do It Yourself!

If you are challenged by the prospect of doing your own experiments, or perhaps you just want to participate in this new lifter hobby, by all means go to it. Tim Ventura, a computer systems man who fell into this vocation/avocation, has put up an excellent website for hobbyists and others who are just getting into the field: www.americanantigravity.com

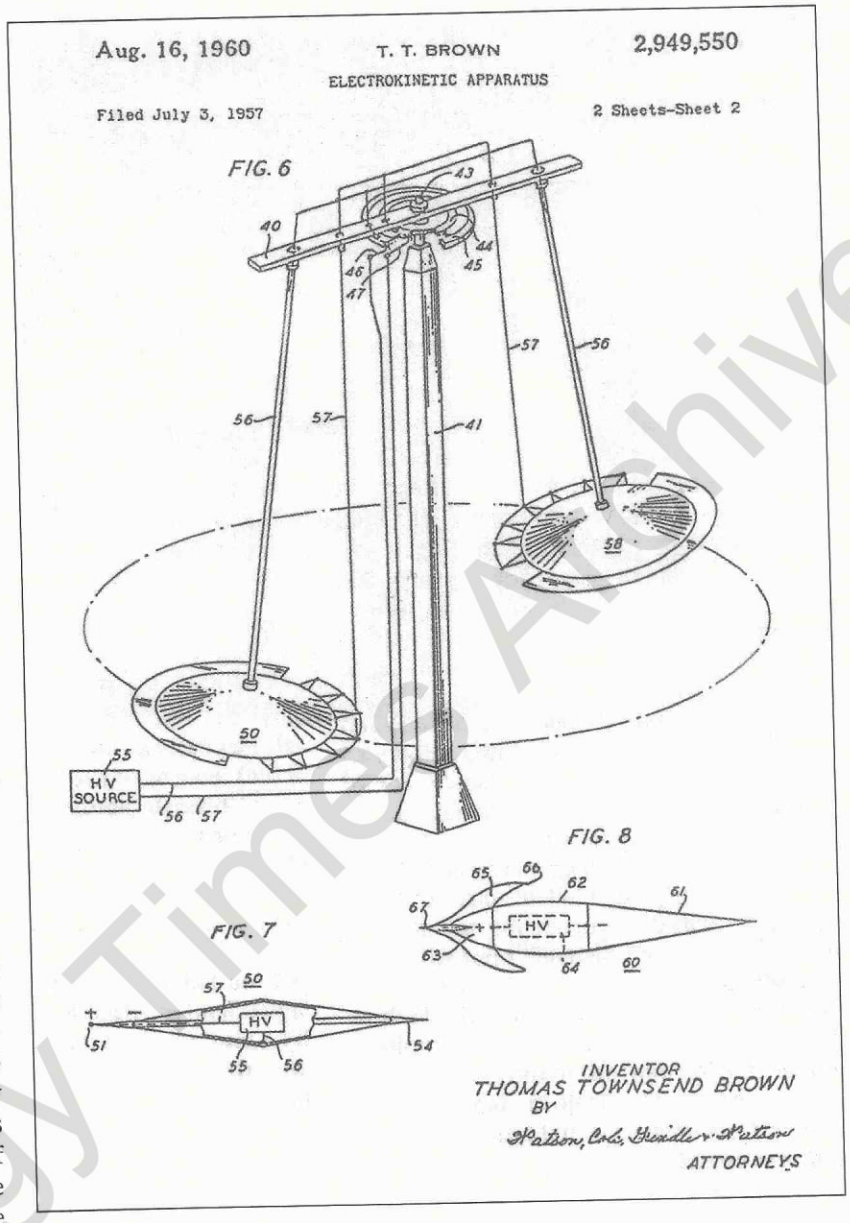
The site has relevant links to technical material of all kinds. Tim Ventura even sells a computer CD with many megabytes of material on it. He was kind enough to let us reprint several of his carefully done "how to" construction segments. So even without web access, newbies can begin to make their own lifters right from this issue of *Infinite Energy*. We also reprint Ventura's gung-ho introductory essay (p. 16), which relates how an Alabama company, Transdimensional Technologies, which made the first of the modern lifter embodiments, led to launching his American Antigravity enterprise. Finally, I have posted some good references at the end of this Introduction. Particularly apt is one published in January 2002 by the staff of our collegial publication, *Electric Spacecraft Journal*.[3] That same journal reports the replication of one of the T.T. Brown experiments by Larry Davenport.[4]

Proceed with caution! This is a fun hobby, but high voltages are involved and we want you all to be safe and alive to see where this lifter phenomenon ultimately leads.

Do not undertake experimentation without fully understanding the hazards involved!

Electrogravitics: The Historical Background

The most important aspect of the lifter phenomenon is recapitulation of the work of American inventor and physicist Thomas Townsend Brown (1905-1985), who grew up in Zanesville, Ohio. From his teen years, Brown was captivated by the relationship of electrical phenomena to gravity. He worked on many inventions that seemed to bear on this connection, and out of which the term "electrogravitics" seems to have emerged. (One of his influential professors in Ohio, Dr. Paul Biefield, allegedly was a classmate of Albert Einstein—an interesting historical connection—and the origin of the term "Biefield-Brown effect.") Tom Valone[5,6] has compiled much useful information about the patents and work of T.T. Brown. He notes, "Unknown to many non-conventional propulsion experts, T. Townsend Brown's electrogravitics work after the war [WWII] involved a classified multinational project. American companies such as Douglas, Glenn Martin, General Electric, Bell, Convair, Lear, and Sperry-Rand participated in the research effort. Britain, France, Sweden, Canada, and Germany also had concurrent projects from 1954 through 1956."



The NASA Patent—and Denials

Another remarkable development in this lifter saga occurred this year. A NASA employee was awarded a U.S. patent, #6,317,310 on the asymetrical capacitor thruster and it is assigned to NASA! We have reproduced key introductory portions of this patent (see p. 30) which seems to be grand theft of the intellectual property of T.T. Brown, with no referencing thereof! The abstract glibly states: "The high voltage source applies a high voltage to the conductive elements of sufficient value to create a thrust force on the module inducing movement thereof." There is no discussion whatsoever in this patent of the infamous "ion wind" explanation of the thrust. Given that NASA is in the business of space travel in vacuo, it is implicit that the inventor and agency believes this technology is relevant to spaceflight—either that or it is grossly misleading people. Is NASA somehow trying to slip potentially *reactionless* thrusters (*i.e.* Newton's Third Law-violating technology!) or heretical "antigravity" technology into the public arena? Probably not. As it is often said, "Never attribute to malice what is more readily explained by stupidity." From an internal NASA memo (sent to Ventura in late May 2002):

> An article appeared in the May 11, 2002, issue of Wired.com/news, by Michelle Delio, about the controversial, and as-yet unresolved, "Lifter" effect; also known as "Asymmetrical Capacitors," "Electrogravitics," and the "Biefeld-Brown effect (circa 1955)." This effect claims anomalous thrust from high-voltage capacitors, and therefore, falls within the scope of Breakthrough Propulsion Physics (BPP). Marc Millis [of NASA] was quoted in the article. The version cited in the *Wired* article is from Tim Ventura, a UNIX programmer for AT&T Wireless. This topic is controversial because most of the recent work, work that was not coordinated with the BPP Project, has focused on promoting claims rather than on credibly resolving the unknowns, and has published these claims in inappropriate venues. Such activities have tainted the overall credibility of BPP research, by association. Fortunately, a new effort, involving a reprogrammed Congressional earmark, has been tasked to conduct an independent experimental test of these "Asymmetrical Capacitor" claims. This new effort, managed by MSFC's Gary Johnson, involves a MSFC-managed earmark to the West Virginia Institute for Software Research (ISR). This work is now being coordinated with BPP Project.

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Yet other "PR" on this topic from NASA alleges that the ion wind explanation suffices to explain Biefield-Brown! Well, the physics establishment has had almost a century to deal with this question and has simply ignored it, but now NASA, with its patent already in hand, proposes to perform a funded study on it. . .toward what end?

Open-Ended Questions: Other Antigravity and Reactionless Thrusters

The basic questions prompted by the lifter phenomenon are these: 1) How do electrical phenomena relate to gravity? 2) Are there "reactionless" forces that can be generated by electromagnetic devices? The know-it-alls of the physics establishment have preferred to deal with the question of gravity's relationship to "electromagnetism" with its favored grand unified theories. "Reactionless forces" are simply too much for the poor physics community to deal with in virtually any forum—so it doesn't discuss them at all—that would be dangerous to its enterprise, like discussing cold fusion dispassionately, without malice.

Whenever actual devices come along, such as the gravity shielding experiment of Evgeny Podkletnov and others,[8] the Establishment develops paroxysms of denial. It is going absolutely berserk already when the "lifter" phenomenon is brought up. It knows subliminally that it can't explain it satisfactorily, so it thinks it can deal with it with a few jokes from spokesman Robert Park. But unlike cold fusion, the lifter phenomenon is already absolutely repeatable on demand. And, it looks like technological applications are possible. Sooner or later, folks are going to find out that the Emperor—Fizzix—really has no clothes. For now, enjoy our coverage on this uplifting matter.

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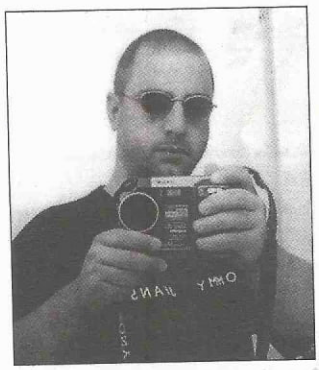
The Evolution
of Lifter Technology

Tim Ventura*

Introduction

Readers of the *Electric Spacecraft Journal*[1] might know a little about the lifter technology popularized recently by Jean-Louis Naudin, but they probably don't know the whole story. In the short amount of time that has transpired since the publication of that article in early 2002, this technology has both literally and figuratively taken off—going from a "proof-of-concept" prototype by Naudin to an international group of researchers investigating how to give the lifter higher performance and greater efficiency. With the first commercial products now on the horizon, if you haven't taken the time to read up on lifter technology, this is the perfect time to do so.

To give you a complete up-to-date overview of where this technology is, where it is going, and what I think it is capable of, let me start with the basics—an overview of how I became involved with electrogravity research and what eventually led me to become involved with lifter technology.



My Background

I started college at age 16, back in 1992. At the same time, I purchased a kit containing "hoverboard plans" from Hovertech, Inc. The moment that I received that $20 white-manila envelope in October 1992 was when I became involved with what has now been nearly ten years of electrogravity research.

I worked with Bill Butler, the president and chief scientist of Hovertech, on a variety of different antigravity, electrogravity, and levitation ideas from approximately 1992 through 1996. While putting in my college time, I was also taking advantage of the enormous college library at Western Washington University (WWU) to read up on everything that might possibly relate to electrogravity. I read books on standard electronics and physics theory, along with books by the masters of this science, such as T.T. Brown and Nikola Tesla.

Bill and I played with several different ideas—many of them only peripherally related to electrogravity. For instance, I published a manuscript initially in 1996 describing Tesla's theory on how to reliably produce ball lightning using a standard Tesla coil—the information courtesy of WWU's excellent library. Bill also assisted me with obtaining video footage of a Searl effect conference that he attended in Denver in the early 1990s. This footage was an excellent overview of Searl's design and construction concepts for what he believes is the next major technological step in aviation and space travel.

Bill and I eventually took different paths, and in some ways drifted apart. Bill moved into geomagnetic levitation research and started intense investigation on the patents of How Wachspress and the magnetic dipole levitator. I became involved with traditional technologies—eventually becoming a UNIX system administrator for AT&T Wireless.

I hadn't heard from Bill Butler for about six months when he sent me a short e-mail containing the words "Hey, check this out"—and a link to Jean-Louis Naudin's "Lifter Experiments" home page (http://jnaudin.free.fr). I visited the site, watched all of the video clips, and then watched them again. This was the technology that I had been waiting for!

Lifter Technology

I can say without a doubt that the lifter technology is completely revolutionary, but you might not realize how profoundly revolutionary it is until you've stopped to think about it. What is it about the lifter that makes it so unique, especially when so many inventions claim to produce more and better electromagnetic thrust? The answer is simple—the lifter works repeatedly, on demand.

Jean-Louis Naudin started a figurative bonfire when he decided to replicate a "proof-of-concept" experiment by a small Huntsville, Alabama aerospace contracting firm. The lifter initially came into being in the mind of Jeff Cameron—the chief scientist of Transdimensional Technologies—in the 1970s from experiments conducted with high-power military and research-grade lasers. A device in the lasers called a "pre-ionizer" was used to apply a high voltage to the lasing medium to facilitate better performance. Repeated operation of the pre-ionizer had a common side effect of horribly twisting the wire and foil combination out of shape, which required a decent amount of work to repair.

Jeff Cameron realized that the torsional effect on the pre-ionizer was a side effect of some unknown force acting on the pre-ionizer apparatus, and he began a long-term investigation into what was causing the apparatus to deform. His eventual results indicated that a force in the foil collector in the pre-ionizer was causing a net thrust in the entire pre-ionizer apparatus that was making it twist and move on its mounts within the laser. The lifter came to him later as a three-dimensional device to demonstrate this force.

Naudin's genius became readily apparent not through a giant breakthrough in technology, but rather in a more subtle fashion—he replicated the lifter experiments of Transdimensional Technologies and published videos, articles, and complete construction plans on his website to allow others to do the same. In a manner similar to the open-source

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software movement, Naudin had taken an incredible scientific find that might otherwise have been overlooked and done an incredibly charitable and intelligent thing—he gave it away for others to play with. By following Naudin's instructions, inventors all over the globe began to slowly replicate the Transdimensional Technologies experiments and thereby validate the proof of concept that Jeff Cameron had created to show that his "mystery force" was real after all. Naudin, of course, took advantage of these replications of the experiment by showcasing them on his own website, which in turn lends additional credibility to his research.

As far as technology goes, the lifter demonstrates that science and engineering have more than their share of humorous irony. For the years that I researched electrogravity and antigravity claims, all of the devices that I had seen required something "magic" to make them work. For instance, Bob Lazar's UFO claims could have been from "reverse-engineering," except that they require "element 115" to make them work—an element chemically related to bismuth that is theorized to potentially have electrogravitic properties. I will come back to the possible electro-gravitational properties of bismuth, because it turns out that this element may in fact have some use for future lifter technology.

The Searl effect disc is an even better example of the "magic" usually involved with building a working electrogravity device. Searl's ideas seem valid enough, but although he supposedly demonstrated several working prototypes in the 1950s, he is currently pursuing millions of dollars in research funding to replicate those experiments in a modern-day setting.

The irony involving lifter technology is that while inventors all over the world have been searching for the perfect electro-gravitational device for decades, the possible working proof of concept for many of these theories has been sitting in front of us the whole time. The lifter costs less than $10 in parts to build, and none of them are magic. In fact, for my experiments, all of the parts could be found at stores within two blocks of my house—balsa wood from the craft store, aluminum foil from the supermarket, 30-gauge magnet wire from the local Radio Shack, and an old computer monitor for the high-voltage power supply.

Lifter Physics

Whether or not Jeff Cameron knew it at the time he constructed his lifter prototype, what he was actually building was a three-dimensional representation of a drawing on a patent application by T.T. Brown in the 1950s. In the patent application, the drawing shows a positively charged wire suspended over a grounded foil body which was meant to demonstrate the most basic Biefeld-Brown effect generator. While Brown's drawing is a little different than Jeff's design, the resemblance is uncanny enough to indicate that both of these men had the same basic force in mind.

T.T. Brown's patent indicates that this Biefeld-Brown effect generator works due to a gradient electrostatic field between the wire and the foil—in essence, these two elements compose a low-efficiency, high-voltage air gap capacitor in which the difference in geometries between the two capacitive elements generates a net-directional force from the larger element towards the smaller element. Jeff Cameron seems to have a practical axiom that goes along with this scientific philosophy, which is that there must be both a leakage current and a capacitance difference between the wire and the foil in order for the lifter to function.

Conventional physics says that two capacitor elements of different sizes will not generate a net-directional force, so what gives? This is actually the thinking that convinced me to abandon my research into Biefeld-Brown effect technology in 1996—physics says it doesn't work. What the books say will happen is that since the wire can only maintain a lower capacitance than the foil, the overall capacitance between the two elements will be reduced to be equivalent to that on the smallest element (or plate) in the capacitor. This, of course, assumes a two-element series-wired capacitor, such as the lifter.

I can give you the conventional physics answer to this small riddle by simply saying that the lifter uses a manifestation of ion wind. The electrons crossing the air gap cause a breeze that causes thrust—since the breeze would be traveling down from the wire to the foil, the thrust would be up, as demonstrated in testing. In the ion wind explanation, the electrons are emitted from the small diameter of the negatively charged wire in such great abundance that they move a significant airflow down to the foil, where they are absorbed and transported electrically back to the HV power supply's electrical ground.

Conventional physics would seem to have the theoretical answer to why the lifter causes lift, but in the experimental setting, which is what we now have an abundance of thanks to Jean-Louis Naudin, the conventional physics explanation doesn't suffice. Experimentally, there are several deviations from the ion wind explanation that seem to invalidate it. For instance, if you completely contain the lifter in a plastic enclosure, it will still generate lift—this would not be the case if a breeze was responsible for lifting the device. How could it be, if the breeze is limited to the inside of an enclosure which itself is levitating?

A more compelling proof that Biefeld-Brown is something other than ion wind comes from Purdue University, where the lifter experiment was replicated inside a vacuum enclosure with positive results. While ion propulsion can work in space, it usually assumes that there is argon, krypton, or other noble gas to be used as the propellant. The vacuum enclosure showed that with no gas available for transport the lifter showed a moderate improvement in performance.

The vacuum enclosure tests are definitely compelling evidence that something else is going on other than ion wind—at least compelling enough for NASA to file patent number 6,317,310, "Apparatus and Method for Generating Thrust Using a Two-Dimensional, Asymmetrical Capacitor Module" (see p. 30). The NASA patent description is as vague as it is compelling. NASA is basically requesting a patent on any technology that generates force using two geometrically dissimilar capacitive plates. Disregarding the fact that this patent was issued nearly fifty years after T.T. Brown's patent using nearly identical descriptions and pictures, and also disregarding the fact that NASA doesn't understand why the lifter generates thrust, it seems apparent that this phenomena is gaining credibility in engineering circles while physicists seemingly continue to deny that anything is going on.

The Evolution of Lifter Technology

Every good movie always has a sequel, and in technology, if at first a major government agency "liberates" your idea, it may seem that a sequel is in order. In the case of the lifter, it

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would appear that the NASA patent would cover this technology to at least some degree—at least until someone overturns this patent under the prior-art rule—which means that the next generation has to be considerably more advanced to escape having their research and development forfeited to the government.

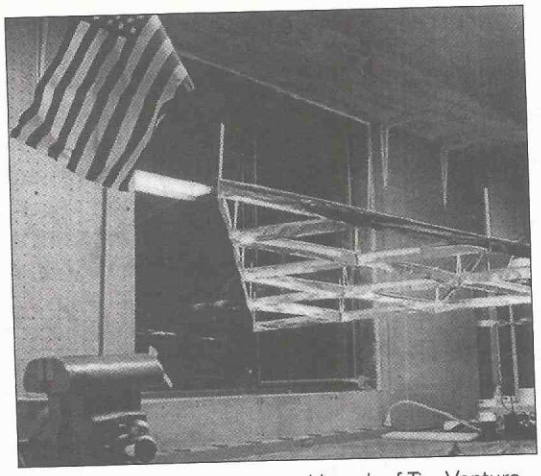

Photo by Tim Ventura.

A lifter hovering over the workbench of Tim Ventura.

The pursuit of more advanced versions of the lifter technology is currently underway by several independent inventors, as well as Transdimensional Technologies itself. Most of the private research by inventors has delved into improving the current lifter design to produce a greater force output and utilize less power to do so. Because the lifter is so simplistic in design, many of these enhancements have been of a very basic nature.

Jean-Louis Naudin was the first independent inventor to do serious work with improving the technology behind the lifter—and even so, the majority of his work has utilized similar materials in more complex arrangements. Naudin has demonstrated dramatically increased lifting forces by building a "lifter inside a lifter" for demonstration purposes. Naudin has also done a great deal of work in breaking up the concept of the single triangular lifter into a parallel series of lifting cells—which means that these cells, working in parallel, can contribute to greater stability and higher force output than any single lifting element.

Saviour, an independent inventor working with Jean-Louis Naudin, has done some of the most interesting improvements on lifter design since those by Naudin himself. Saviour's concerns have not focused around the "bigger is better" philosophy that many inventors have stuck by; he has done several experiments to determine the radiation output, remote-controlled applications development, and materials analysis and improvement on the lifter that others have not had the time or expertise to conduct.

A recent experiment by Saviour demonstrates just how this gentleman's foresight is helping other experimenters. Saviour substituted nichrome heating wire for the common lightweight wire used for the emitter, and demonstrated that the lifting force greatly increased when a higher potential 12-volt charge was used to heat the emitter wire in conjunction with the standard high voltage charge coming off it.

Transdimensional Technologies—the developers of the initial lifter design—are taking the approach to optimizing lifter performance to another level. They are currently not-so-secretly working on a second generation lifter, which will consist of a one-piece layered material to replace the current wire and foil design.

The layered material approach to the lifter is an idea that Jeff Cameron may or may not have had after some lengthy discussions with Travis Taylor, the man responsible for testing some anomalous materials known as "Art's Parts."

Art's Parts were some pieces of material sent by an unknown person to the Art Bell radio talk show with a note stating that the they were pieces of UFO wreckage taken from the often-cited "Roswell crash" in 1947. Whether or not the pieces of material actually came from that "crash" is unknown, but Art Bell did the honorable thing by sending them to an acquaintance in U.S. Army research, Travis Taylor, for a professional scientific investigation.

Taylor, who apparently tested the materials after-hours in a world-class research lab to avoid potential classification by his superiors, used an electron microscope to determine that the layered materials were actually pieces of metal—containing several hundred microscopically thin layers of magnesium and bismuth. Taylor also tested the layered metal with a high-voltage apparatus, which seemed to indicate that when a voltage was applied to the material, the layered metal would move—and in some cases levitate.

Taylor reported his findings to Art Bell and sent video clips of his high-voltage experiments, which eventually made it to a permanent home on the Art Bell radio show website. In addition, Taylor conveyed his belief that the only manner in which the pieces of metal could properly be produced was through an advanced form of electron-deposition technology, due (apparently) to an absence of oxygen molecules between the different layers of metals. Additionally, the layers of metal were too thin to have been mechanically produced.

Jeff Cameron indicated that Transdimensional Technologies maintained some contact at one point in time with Travis Taylor, apparently as professional colleagues in the defense community in Huntsville, Alabama. I am not an expert on this relationship, other than to say that to the best of my knowledge these two individuals knew and contacted each other, and that this is how Jeff Cameron might have come up with the second generation lifter idea.

Advanced Lifter Technology

As an inventor, I couldn't care less whether or not the idea for the technology came from a "crashed UFO." To be perfectly honest, I'm not what you would call a "believer" in UFOs anyway, although I have often wondered about them. My point is not to attempt to lend any credibility to "Art's Parts," but rather to tie in the properties of the anomalous material's high voltage movement with the underlying theory of lifter operation.

Even mentioning a UFO in a respected publication or article is the kiss of death in today's world—and I wouldn't do it if it wasn't an integral part of the story. The other interesting thought is that the layered material is once again partially composed of bismuth—which is thought to possibly have some of the same electro-gravitational properties as Bob Lazar's Area 51 "element 115." Is there a similarity, or merely a coincidence between a claim that hasn't gained credibility and a technology currently under development?

The lifter in its own right is essentially a layered material. One of those layers is the emitter wire, which is highly charged to about 30kV, another layer is the air gap, which is approxi-

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mately 3 cm in height, and the final layer is an electrically-grounded "skirt" of aluminum foil that surrounds the lifter. It is also reasonable to expect that there are only two possible forces at work in the lifter—one of which is a possible ion wind effect moving down from the emitter to the foil, and the other being a possible Biefeld-Brown effect, moving up through the foil to the emitter.

There are a few shortcomings in the lifter as a design that might be overcome if we could transition the layered material from one containing an air gap to one that does not. For instance, the lifter is currently a rather delicate object; using a wire under tension as the emitter makes construction difficult for future automated assembly. Additionally, because the air gap requires struts to support the emitter wire, a trade-off involving the weight versus the strength of the struts is also inherent in any current implementation of lifter technology.

Some of the other changes that would be helpful to implement when transitioning lifter technology from one type of air gap to another are changes in the materials used to increase the dielectric capacity. High-K dielectric materials may be used to increase the displacement of electrons in the material to enhance charge transport. And since increasing the dielectric potential of the layered materials also increases the breakdown resistance, it means that thinner materials can be used.

Designing a lifter without an air gap would accommodate lower voltage requirements between the foil and the emitter. The voltage would not have to create the large e-field gradient to create a leakage current across such a large void. Therefore the overall voltage across the device could be greatly reduced, without much cost in thrust. A lower operating voltage in turn means that a lower output power supply can be used for a given amount of current, which increases the overall efficiency.

Transdimensional Technologies' recent research utilizes the layered materials approach to eliminate the air gap and substitute for it high-K dielectric materials that may allow higher overall performance. Although they have not yet released details about the exact composition or thickness of the materials that they are working with, they claim now to have a 10% reduction in weight using a low-voltage current across the thickness of their newest device.

Future Lifter Technology

Thanks to the tremendous amount of research being done on lifter technology by Transdimensional Technologies and a loosely affiliated group of inventors around the world, the future of lifter technology seems very bright.

Transdimensional hopes to release some breakthrough research to allow replication of their newest second generation experiments in the very near future. Along with that stands the massive body of research and advancements being done by inventors and researchers such as Jean-Louis Naudin, Saviour, the Lifters e-group, and myself.

My personal goals are to attempt to assist Transdimensional Technologies in popularizing this technology to increase awareness of it and help "spread the word" about what it is and how it can potentially help the world.

Imagine that instead of getting in your car and driving through the usual maze of thoroughfares and side streets, you were able to simply type in your destination and have a flying vehicle take you there automatically. The lifter technology offers the potential to transform the current transportation market by offering point-to-point aerial transport without the need for roads or freeways.

Additionally, unlike the magnetic levitation ("Maglev") technologies that are currently being promoted for the future of transportation, the lifter does not require a specially constructed and expensive track. This greatly reduces the per-unit cost of the technology and opens the door for wider adoption by the general public for transportation solutions.

Other individuals are currently working to see if lifter technology may offer cost-effective methods of transport into space, which would reduce the cost greatly and allow a one-piece, reusable method to move things into orbit. ❐❐❐

Reference

1. Staff Report. 2002. "Naudin's Lifter Phenomenon," *Electric Spacecraft Journal*, 33, January 16, 18-22.

Lifter Resources

Much research on lifter technology is available to the public on the internet. The list of resources below are some of the better and more common resources to obtain detailed lifter information.

American Antigravity
❐ http://tventura.hypermart.net
❐ My website includes video clips, complete instructions, and other related lifter information.

Jean-Louis Naudin's "Lifter Experiments Website"
❐ http://jnaudin.free.fr
❐ A very in-depth website containing video clips, complete instructions, etc.

Worldwide Lifter Replications
❐ http://jnaudin.free.fr/html/lftwrld.htm
❐ An overview with photos and videos from many of the independent inventors who have replicated the lifter experiments.

Transdimensional Technologies, Inc.
❐ http://www.tdimension.com
❐ The home page for Transdimensional Technologies, developers of the lifter design.

Blaze Labs (Saviour's Research Website)
❐ http://bel.150m.com
❐ An excellent site on research into lifter enhancements, radiation testing, sealed devices, power supplies, and other topics related to lifter technology.

Lifter Builders Group
❐ http://groups.yahoo.com/group/Lifters
❐ An email group for the exchange of research findings for those interested in building lifters or staying current on the state of the technology.

*9738 NE 138th Place, Kirkland, WA 98034;
E-mail: tventura6@attbi.com

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Gravity-Drive Construction Guide

This section on constructing a lifter was prepared by Tim Ventura.

Warning Notice: This document is intended for educational use only! The project described in this document uses extremely high-voltage power sources, and is intended for readers over 21 years of age who are experienced working with dangerously high voltages. If you are not a legal adult, or are not proficient working with dangerously high voltages, do not try to build this project without expert supervision. The author of this document and *Infinite Energy* are not responsible for any death, injury, or property damage resulting from or relating to the procedures shown or devices described in this document.

Purpose of This Document: This document provides a step-by-step description of the methods and procedures involved with building a prototype electrokinetic propulsion device. If properly constructed, this device will generate enough force to levitate itself from a resting surface.

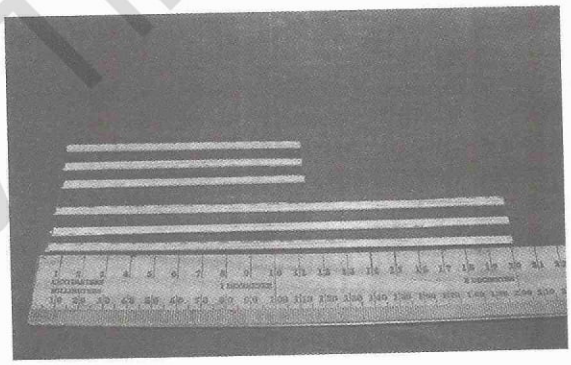
Step 1: Obtain Required Materials

- 2 mm by 6 mm balsa wood strips
- 30-gauge enameled copper magnet wire
- Aluminum foil (*not* heavy duty type)
- 1 tube "Super Glue" or "Krazy Glue" brand cyanoacrylate adhesive (suitable for wood)
- Sewing thread
- 1 hobby knife
- 1 25,000+ volt DC power supply
- 1 Scotch brand tape roll
- **NOTE:** For more details, please see "Required Materials" document.

Step 2: Cut Balsa Support Struts

Cut the balsa wood strips in half to create 2 mm by 3 mm strips. Cut these into two sets of balsa struts—one set of 3 struts 20 cm in length, and a second set of 2 struts 11 cm in length.

Bevel the edges of each of the 20 cm struts to allow it to be glued later at an angle to the 11 cm struts. The beveling should be about 30 degrees in slope, and remember to bevel both ends on the same side of the balsa face.

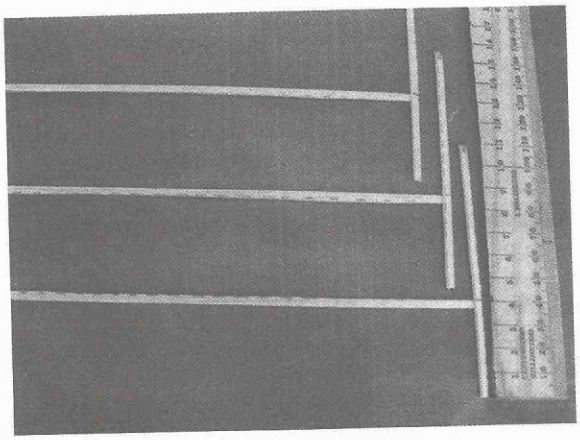


Step 3: Assemble Balsa Struts

Mark each of the 11 cm struts at the top (to help you remember which end is up) and again at a mark 4 cm up from the bottom.

Sparingly use Super Glue to attach each of the three vertical 11 cm struts to a 20 cm horizontal strut, as shown in the picture.

In the picture, the beveled ends of the 20 cm struts have been glued at right angles at the 4 cm mark on the vertical struts.



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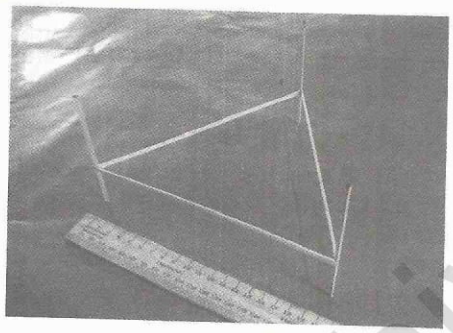
Step 4: Complete Chassis Assembly

- Similar to Step 3, glue together the three pieces of the lifter frame using Super Glue. Glue the unconnected ends of the 20 cm struts to the other side of the 4 cm mark that you created on the vertical strut in Step 3.

Ensure that the ends of the lifter line up, as shown in the picture.



Step 5: Cut Aluminum Foil Strip

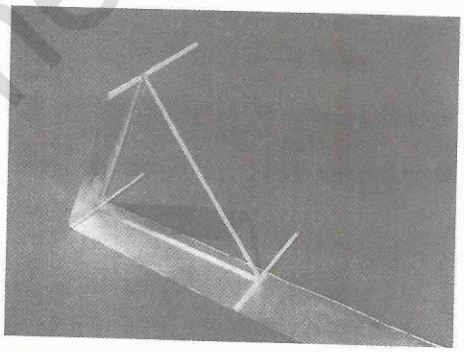
- Cut a strip of aluminum foil 5 cm wide and approximately 1 meter in length. This foil strip will be used to surround the bottom part of the lifter.

Step 6: Fold Foil Around Chassis

- Put glue on the 20 cm strip and hold it onto the foil until it sets. Notice in the picture how the foil is even with the bottom of the vertical struts. If done correctly, you should have an extra 1 cm of foil above the 20 cm balsa horizontal strut.

Roll the lifter chassis down the length of the foil, gluing for each side of the chassis as you go.

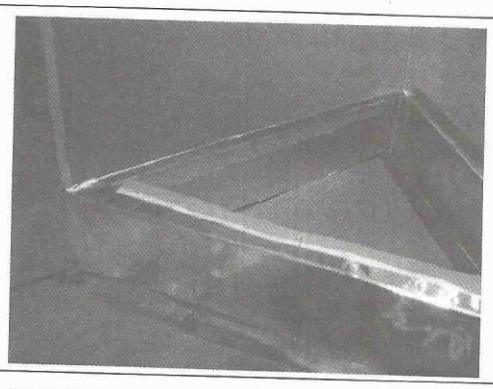
You must have an extra 1 cm lip above the horizontal struts to reduce ion leakage.



Step 7: Fold Down Foil Edges

- Cut the corners around the top of the 1 cm lip above the horizontal struts and fold the foil over the top of the strut for each of the three lifter sides.

Use a piece of Scotch tape cut in half lengthwise to hold the folded corners as close to the inside of the foil as possible and reduce leakage.

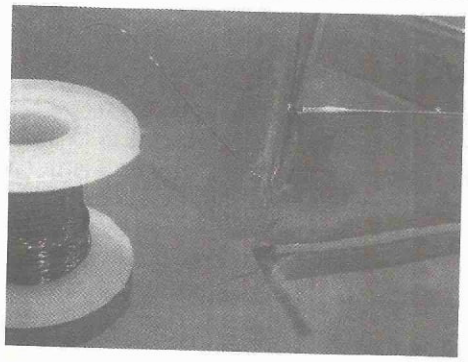


Step 8: Attach Ground Wire to Foil

- Poke a small hole through the foil skirt and run the ground wire through it, as shown in the picture. The hole should be behind the strut so that the wire is supported by it.

Make sure to strip the ground wire of its enamel coating before you connect it. The ground wire must have a section of bare copper to contact the foil in order to work.

Give yourself about two extra feet of wire off the lifter to connect it to your power supply's ground.



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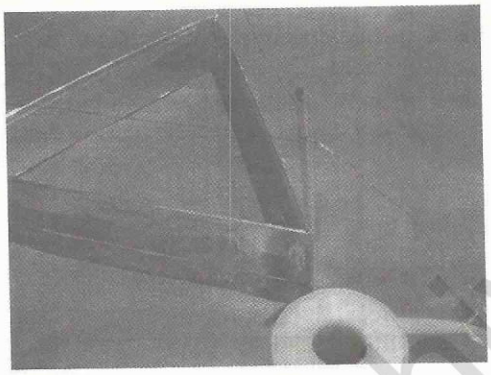
Step 9: Attach Corona Wire

▸ Approximately 4 cm up from the top of the foil, or about 2 cm from the very top of the vertical support struts, run a length of magnet wire around all three vertical struts.

Make sure to loop the wire around each of the vertical struts at least once to ensure that it stays in place, and when you come back to the first vertical strut, tie the wire off so that the corona wire runs around the entire frame of the lifter.

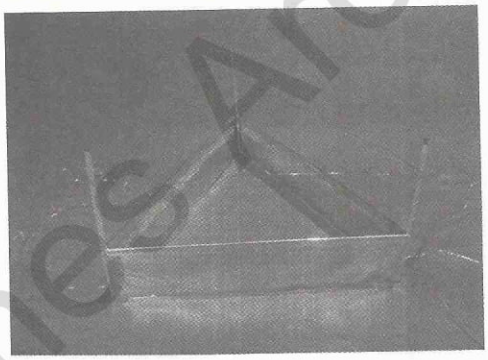
After you have the corona wire in place, scrape some of the enamel off of the wire along the bottom of the wire facing the foil.



Step 10: Finished Lifter

▸ If you have correctly followed the above steps, you should have a lifter prototype identical to the one shown here.

Use the "Testing Guide" document to assist you with testing the lifter.



Gravity-Drive Required Materials

Materials: Construction of a lifter requires the following materials:

- Balsa wood strips
- Magnet wire
- Aluminum foil (*not* heavy duty type)
- Cyanoacrylate adhesive (Crazy Glue or Super Glue)
- Scotch tape
- Sewing thread
- Hobby knife
- Metric ruler
- Computer monitor

1: Balsa Wood Strips

- **Type:** 2 mm by 6 mm strips
- **Price:** $0.49 each (total of 4)
- **Notes:** I purchase 2 mm by 6 mm balsa wood strips and split them down the middle length-wise until they measure only 1 mm by 3 mm. You need probably 1 meter of balsa—buy extra just in case because it breaks very easily. Make sure to buy balsa wood—do not buy bass wood. Although bass wood is commonly sold next to balsa wood as a substitute, bass wood is *too heavy*, and also more difficult to cut.

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2: Magnet Wire

- **Type:** 30-gauge enamel-coated copper
- **Price:** $3.99 at Radio Shack
- **Notes:** Radio Shack sells this in a three-pack containing 26, 28, and 30-gauge magnet wire. The 30-gauge wire has a red enamel coating, and should be on a spool containing enough to build several lifter prototypes. Enamel-coated wire is not required, but reduces extraneous ion leakage.

3: Aluminum Foil

- **Type:** Reynolds or generic brand foil (*not* heavy duty)
- **Price:** $2.99 (approximate)
- **Notes:** Make sure to use aluminum foil and *not* tin foil. Tin foil will probably be too heavy to work correctly. You can use regular generic brand aluminum foil from the grocery store.

4: Cyanoacrylate Adhesive

- **Type:** Super Glue or Krazy Glue (suitable for wood)
- **Price:** $1.99
- **Notes:** I recommend using cheap, regular Super Glue from a squeeze-tube applicator. Do not use the pen-style applicator, as it will probably damage your balsa wood. (The pen-style contains a small plastic nub that requires pressure.) Also, do not use the gel-style glue unless you absolutely have to, because it does not hold very well on balsa wood. I use about 1/2 tube per lifter.

5: Sewing Thread

- **Type:** Standard or extra-strong sewing thread
- **Price:** $1.00 (approximate)
- **Notes:** I use extra-strength sewing thread for the tethers on my lifters. Make sure to use very lightweight thread—normal strength thread should be fine.

6: Hobby Knife

- **Type:** Exacto brand or generic
- **Price:** $2.99 (approximate)
- **Notes:** I am using an Exacto brand knife for cutting the balsa wood. You will want to make sure that you have a very sharp blade on the knife in order to properly bevel the ends of the balsa support struts.

7: Scotch Tape

- **Type:** Scotch brand or generic tape (3/4" width)
- **Price:** $1.99 (approximate)
- **Notes:** Scotch tape or generic brand—either clear or translucent tape is fine. Scotch tape is required to anchor the lifter tether threads. It is also required to reduce ion leakage on the folded inside edge of the foil anode.

8: Computer Monitor Power Supply

- **Type:** 25,000+ volt DC or higher output
- **Price:** $100 (approximate used price)
- **Notes:** My tests were successful using a computer monitor power supply, but a monitor is not required—only the approximately 30kV DC power output. Most 14 inch or larger computer monitors should provide enough power to work correctly—a tube-style monitor is required (LCD monitors are not high voltage).

9: Metric Scale Measuring Ruler

- **Type:** Any ruler offering metric scale measuring for millimeter and centimeter scale measurements
- **Price:** $1.00 (approximate)
- **Notes:** Any ruler should work—the lifter dimensions are not as critical as the weight.

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Gravity-Drive Safety Guidelines

Safety Guideline 1: Author's Disclaimer

- This documentation is for educational use only! The author and *Infinite Energy* take no responsibility for death, injury, or property damage that may occur as a result of the procedures or devices shown in this document or included with this documentation package.
- The author of this documentation is not an expert on fire safety or high-voltage safety. The safety guidelines that he outlines in this document are the minimum guidelines to reduce the chances of serious death or injury, but they are by no means the only guidelines. Readers should ask a safety expert for additional advice before attempting to build anything outlined in this documentation.

Safety Guideline 2: No Under-Age Tinkerers!

- If you are not a legal adult (21 years old) or experienced working with dangerously high voltages, do not attempt to follow any of the guidelines or procedures outlined in this documentation without supervision from an adult expert.

Safety Guideline 3: High-Voltage Safety

- Be aware of the voltages involved with this project. The average computer monitor has a high-voltage output of approximately 25,000 to 30,000 volts—this is easily enough to kill or seriously injure you. If you do not feel comfortable working with high voltages, then don't! Get someone with expertise in this area to assist you before continuing.
- Always wear a pair of heavy rubber gloves (lineman's gloves) when working with high-voltage power supplies. Other types of rubber gloves will not provide enough insulation to prevent high-voltage electrical charges from passing through them and shocking you.
- Always remember the electrician's rule of thumb—work with one hand only! Working on wires with dangerously high voltages with only one hand reduces the chance of death if you receive a shock. If you are grasping with both hands and receive a shock, the electricity will pass directly through your chest—this is more likely to cause heart trauma than working with one hand only.
- Always be aware of the status of your power supply. Remember if it is turned on or off. The author's failsafe method is to completely unplug his power supply from the electrical outlet and wait for the HV charges to dissipate before working with anything that might potentially cause electrocution.

Safety Guideline 4: Fire Hazards

- Be aware that the voltages and electrical procedures involved with this project are potential fire hazards. Due to the high voltage nature of the lifter power supply, the possibility of arcing and subsequent fire is a very real possibility.
- Keep a fire extinguisher handy in the event that a fire does occur. Ensure that your fire extinguisher is safe to use on electrical fires. Water-based fire extinguishers are not acceptable for this purpose, as the stream of water will conduct high voltages back to the extinguisher and cause electrocution.
- Never leave any high-voltage project unattended, for any length of time, due to the risk of fire resulting from electrical arcing or short circuits. Always remove the power and ensure that your work area is safe before leaving a high-voltage project area.
- Remove any and all combustible materials from your work area before testing any high-voltage projects. Be aware that high-voltage electrical charges will ignite combustible fumes. Examples of combustible materials and containers include, but are not limited to: gasoline cans, fingernail polish, paint and painting supplies, heating oil and kerosene, rubber cement, most glues, etc. Check your work area to make sure that these materials are not in the vicinity before testing.

Safety Guideline 5: Computer Monitor Tampering

- The author's demonstration of how to modify a computer monitor to obtain high-voltage current is for educational use only! Be aware that tampering with a computer monitor is likely to void any warranties that you may have on the monitor, as well as potentially damage or destroy the functionality of that monitor.
- Be aware of implosion danger from computer monitor picture tubes. The picture tube in a computer monitor is vacuum pressurized by the outside atmosphere, and will shatter if dropped or damaged. Make sure to put the plastic monitor shield back on the monitor after connecting high-voltage wires to reduce the chance of flying glass if implosion does occur.

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- Be aware of potential fire danger from computer monitor high-voltage power supplies. Modifying a computer monitor to operate in a manner in which it was not designed may result in fire. Consult safety guideline number for additional information on reducing the potential for fire damage.
- Be aware of electrocution danger resulting from dangerously high voltages.

Safety Guideline 6: Work at Your Own Risk

- This document is for educational use only! Any work conducted as a result of the information contained in this documentation is done completely at the reader's own risk. The author would like to reiterate that the project described in this document can be very dangerous.

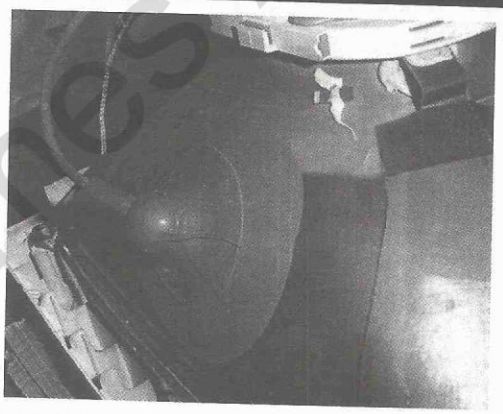
Safety Guideline 7: Use Common Sense

- In addition to the safety guidelines outlined in this document, the author would like to remind the reader to use his or her common sense when working with high voltages and fire dangers.

Gravity-Drive Testing Guide

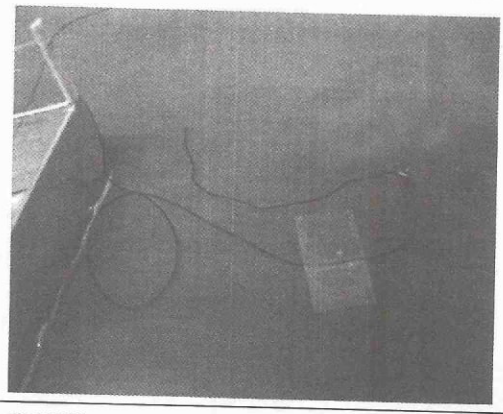
Step 1: Unplug Monitor and Remove Case

- Unplug the power supply from the monitor and let it sit for one hour to discharge the HV power supply.
- Wear electrician's gloves (rubber insulating gloves to prevent electrocution) and remove the screws holding the monitor case onto your computer monitor. Remove the plastic monitor case from your monitor.
- The author's monitor (shown on right) is face down sitting on a dry, folded bath towel for safety.



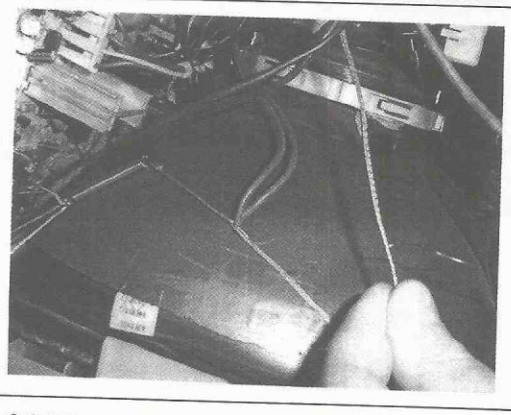
Step 2: Attach Tie-Down Tethers

- Attach the three tether threads tied to each end of the lifter to the testing surface using pieces of Scotch tape.
- The tethers prevent the lifter from flying too high during testing, and additionally provide attitude control to reduce the chance of the HV power supply and ground wires becoming crossed.
- Make all of your tethers 8 to 14 inches long.



Step 3: Connect Ground Wire

- Wearing electrician's gloves and with the monitor still unplugged, connect the ground wire attached to the foil-skirt at the bottom of your lifter to one of the silver-colored ground wires that surround the picture tube of the monitor.
- Make sure that the enamel has been stripped off the end of your ground wire to ensure a good connection.



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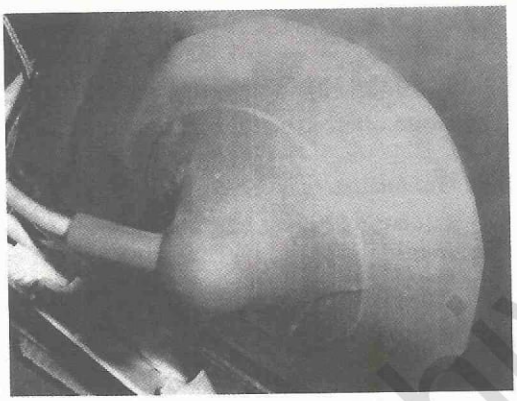
Step 4: Connect High-Voltage Lead Wire

- Wearing electrician's gloves and with the monitor still unplugged, carefully lift up the edge of the rubber plug attached to the side of the picture tube. Connect the corona wire by crimping the end of the wire and hooking it around the HV terminal (metal posts under the rubber lip of the suction cup).

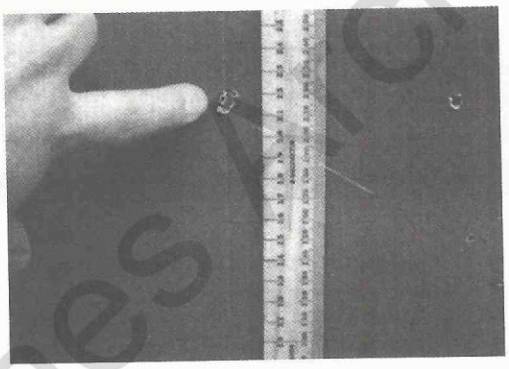
- Ensure that the enamel has been stripped off the end of the corona wire, and let the rubber lip regain suction after hooking the wire around the posts.



Step 5: Support the HV and Ground Wires

- Wearing electrician's gloves and with the monitor still unplugged, support the middle of both the ground wire and high-voltage wire up to about 10 inches from the testing surface. This is done to reduce ion leakage and reduce the amount of weight the lifter needs to lift.

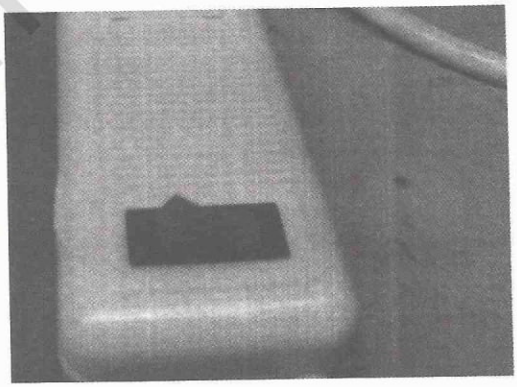
- In the photo on the right, the author has used the hobby knife to drill a support hole for the ground wire (shown) at approximately 21 cm in height.



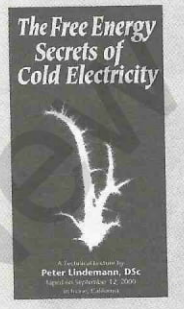
Step 6: Turn on the HV Supply

- Wearing electrician's gloves, plug in the monitor and turn the power switch on. After about two seconds, you will hear a hissing noise and should see a few small sparks between the corona wire and the lifter foil body.

- Your lifter should immediately lift from the testing surface. If it does not, trying gently blowing on it. If it has not moved after approximately ten seconds, turn the power off and consult the "Troubleshooting Guide" document available on my website, www.americanantigravity.com.



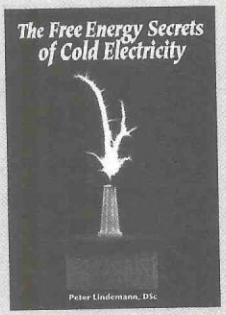
The Free Energy Secrets of Cold Electricity—Video and Book



170 min.
NTSC or PAL Format
$29.95 Domestic
$39.95 Foreign

The video is a technical lecture (September 12, 2000) by Dr. Peter Lindemann. A coherent discussion of the possible connections between free energy claims by inventor Edwin Gray in the 1970s-1980s and the much earlier alleged "free" energy broadcasting ideas of Nikola Tesla. Those who experiment and speculate about energies connected with arc discharges and lightning will find in this material highly creative hypotheses.

The book is a wonderful companion to the video. Covers the same material, but goes beyond the video in its publication of text and graphics, making it possible to do detailed study. Appendices include patents by Edwin Grey and Nikola Tesla, as well as two excellent articles by Dr. Lindemann.



Paperback, 133 pp.
$29.95 Domestic
$39.95 Foreign

Prices include shipping and handling.

Cold Fusion Technology • P.O. Box 2816 • Concord, NH 03302-2816
Phone: (603)228-4516 Fax: (603)224-5975

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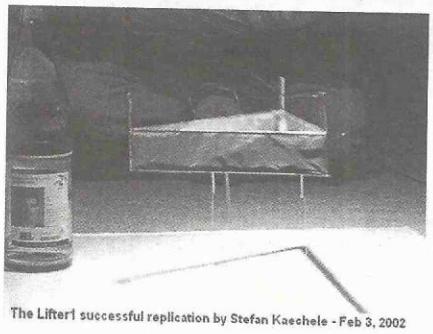
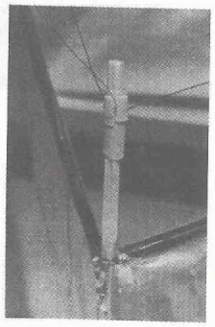
A Sampling of Lifters from Around the World

(Photos and information courtesy of Jean-Louis Naudin's website, http://jnaudin.free.fr, which contains a wealth of information.)

– Stefan Kaechele, Germany –



The Lifter1 successful replication by Stefan Kaechele - Feb 3, 2002



Lifter 1

Kaechele's solution for adjustable wires is a blade of straw cut in pieces, glued with cyanacrylate-gel. "Distance" noted below is separation of electrodes.

Results:

Lift-off voltage:	18KV	31mm wire distance	250µA current
	15-16KV	25mm wire distance	250µA current
	14KV	20mm wire distance	450µA current

Polarity on the wire in all three cases was minus, with a weak hissing sound. The lift-off power is between 2.2 W/g and only 1.3 W/g. The results were:

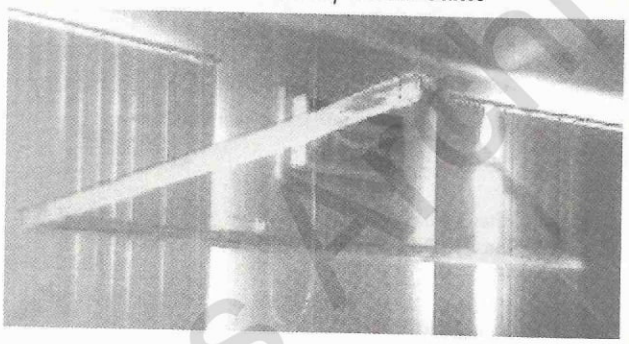
18KV 31mm wire distance and 0.25mA = 1.5W/g

15-16KV 25mm wire distance and 0.25mA = 1.3W/g

14KV 20mm wire distance and 0.47mA = 2.2W/g

Used a pure DC and the values above are mere output taken from the scales of the high-voltage power supply. Rough estimations about real losses are another 200µA of the measured currents above. That means the real needed power for the lift-off was, in the best case, 250 mW per gram.

– Russell Anderson, United States –



Beamship Lifter Variation 3

Specifications

Weight:	42 grams
Width:	6 feet on each side (2 Meters)
Height:	18.5 inches
Anode Wire:	#40 Stainless Steel
Wing Foil Height:	2 inches
Spark Gap:	2.75 inches
Ambient Temperature:	71 degrees F.
Amb. Relative Humidity:	68%
Date:	Sunday, May 12, 2002
Timestamp:	1:55 pm EDT
Beamship is weightless at:	30,000 Volts straight DC @ .85 mA current, about 25.5 W.

Beamship Variation III is in a stable neutral hover 4.5 feet off the lab floor at: 35,000 Volts (35KV) @ 1.35 mA current. That's 47.25 watts for a 2 meter, 6-foot wide scale model electric spacecraft. Still has plenty of upward thrust at full power.

– Jeff Brown, United States –

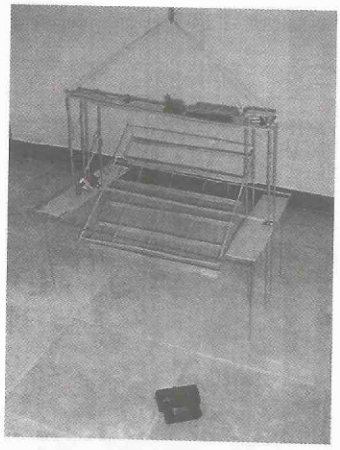
The Lifter Copter built by Jeff Brown - 01-27-02

Lifter Copter

Above is Brown's latest helicopter. He says that with four blades, the helicopter tends to tilt to one side and crash, because the blades make it very top heavy. He says he can't afford to add any weight to the base, because it might not lift off at all. He also says that he thinks that it should be possible to cant the blades at a very aggressive angle (without stalling).

– Mr. Saviour, France –

The Saviour's RC-Balloon Lifter experiment



RC Balloon-Lifter

The RC lifter panel is mounted on a balsa structure. Center shaft is motorized and can turn 360 degrees to provide control in any direction in one vertical plane. Shown in the photo to the right are an infra-red remote control and all electronics on the upper shelf of the structure. Other photo shows balloons assisting with lifting.

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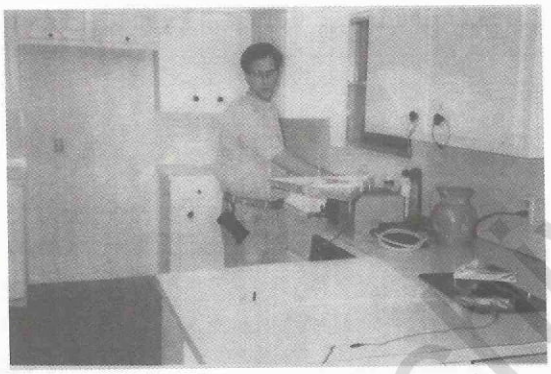
– Jung-Seo Park, South Korea –

Lifter 1
A successful Lifter 1 experiment by Park, using a 40 kV HV power supply, 20 mA neon transformer, and a voltage doubler circuit.

– Daniel Melichar, United States –

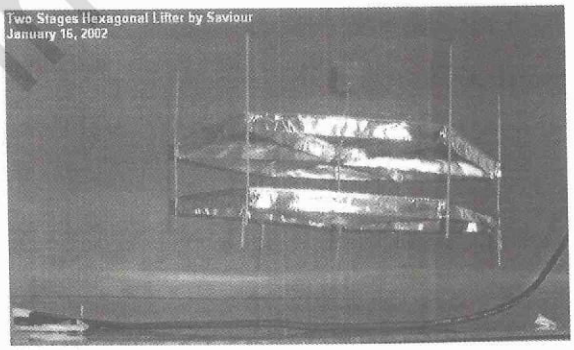


Lifter 2
Melichar made Lifter 2 in December 2001 and is presently working on miniaturizing the power source, heating the cathode (possibly to incandescence using tungsten in a vacuum), and testing lifters in SF6 or freon R-12.

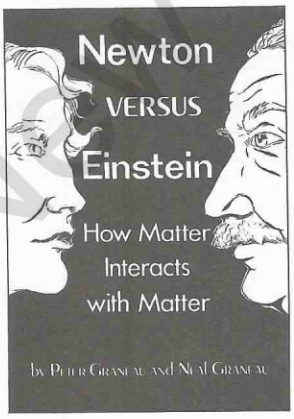
– Jean-Louis Naudin, France –

RotoLifter 1
Two basic lifters mounted on a rotating apparatus, to get more data about the lifter's speed, acceleration, and power ratio.

– Mr. Saviour, France –



Stacked Lifter
This lifter weighs 11 g and lifts an additional weight of 19 g, including weight of container. Top wire and bottom foil are positive (connected together) and the middle foil is negative.



Newton Versus Einstein:
How Matter Interacts with Matter

Peter Graneau and Neal Graneau

$19.95 North America
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Some Experiments and Replications by J.L. Naudin

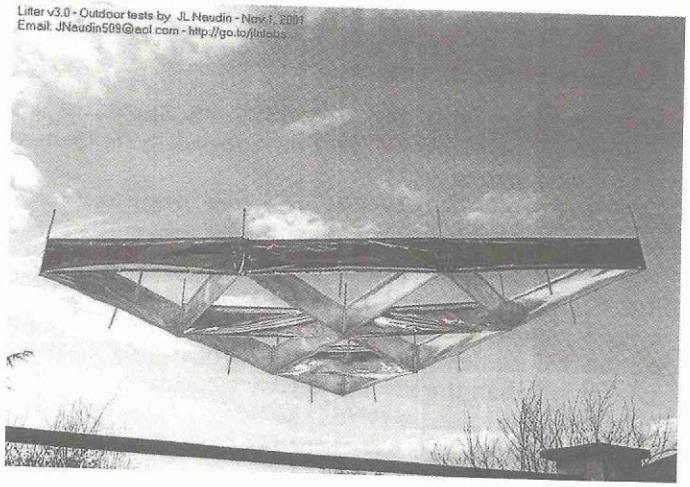

Photo 1. Outdoor testing of Lifter 3.

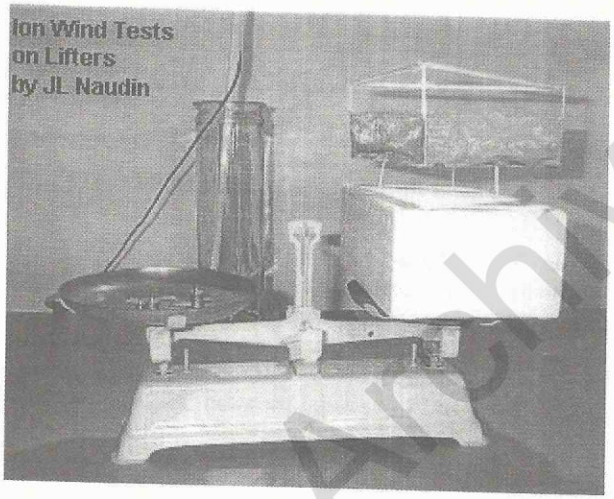

Photo 4. An ion wind test with Lifter 1, part of a series of tests to determine the role of ion wind.

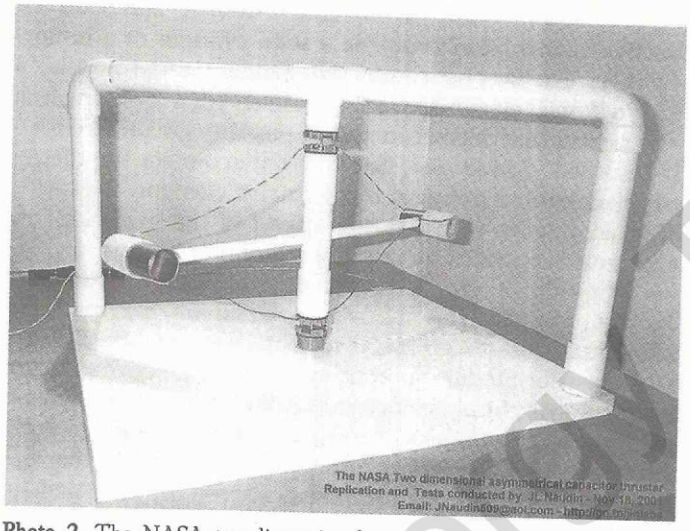

Photo 2. The NASA two-dimensional asymmetrical capacitor thruster tested on a rotating arm.

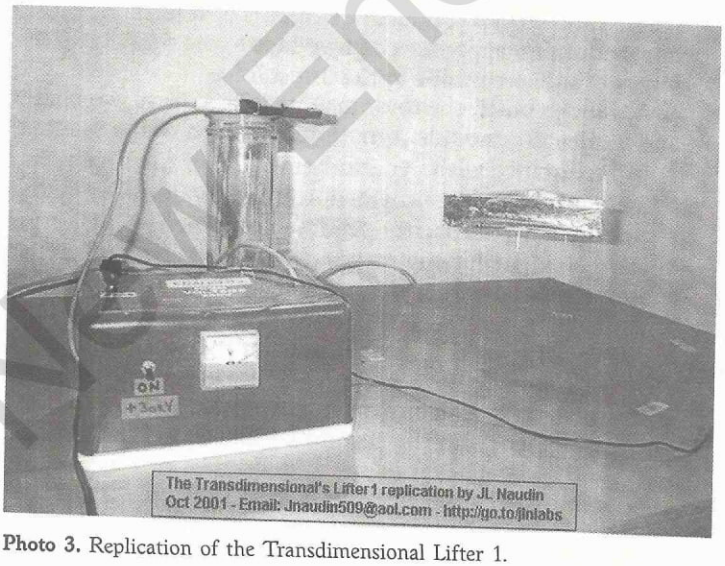

Photo 3. Replication of the Transdimensional Lifter 1.

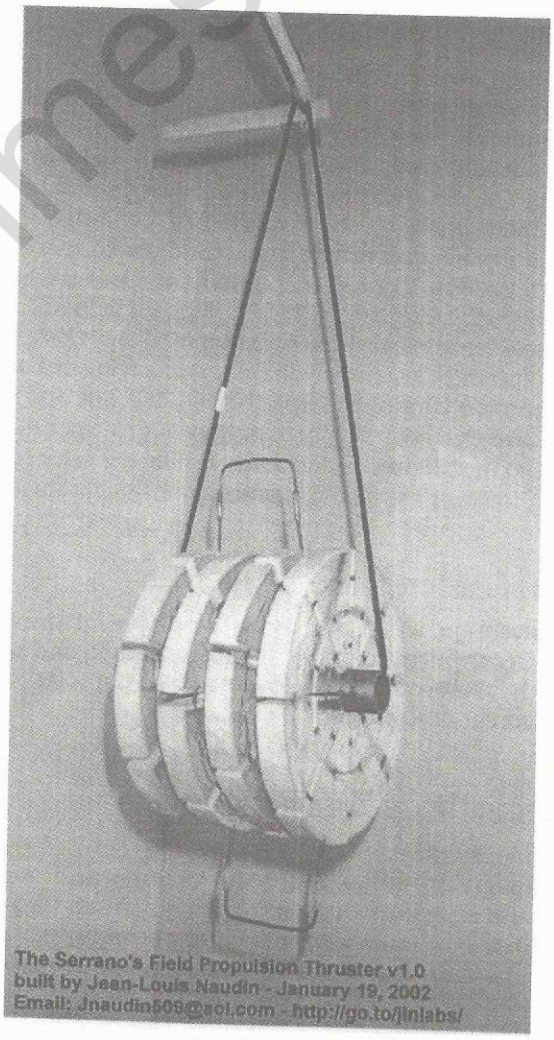

Photo 5. The Serrano field propulsion thruster 1 being tested on a rotating arm. See patent WO/00058623, "Propulsion Device and Method Employing Electric Fields for Producing Thrust."

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Apparatus and Method for Generating Thrust Using a Two-Dimensional, Asymmetrical Capacitor Module

(Patent Introductory Material Only)

Patent No.:	**US 6,317,310 B1**
Date of Patent:	November 13, 2001
Inventor:	Jonathan W. Campbell, Harvest, AL
Assignee:	The United States of America as represented by the Administrator of the National Aeronautics and Space Administration, Washington, D.C.
Appl. No.:	09/520,817
Filed:	March 8, 2000

Abstract

A capacitor module system is provided for creating a thrust force. The system includes a capacitor module provided with a first conductive element having a cylindrical geometry. The first conductive element can be a hollow cylinder or a solid cylinder. The capacitor module also includes a second conductive element axially spaced from the first conductive element and of a smaller axial extent. The second conductive element can be a flat disk, a dome, or a conductive tip at the end of a dielectric rod. A dielectric element is disposed between the first conductive element and the second conductive element. The system also includes a high voltage source having first and second terminals connected respectively to the first and second conductive elements. The high voltage source applies a high voltage to the conductive elements of sufficient value to create a thrust force on the module inducing movement thereof.

Origin of the Invention

This invention was made by an employee of the United States Government and may be manufactured and used by or for the Government for Governmental purposes without the payment of royalties.

Background of the Invention

1. Field of Invention

The present invention relates to methods and apparatus which use capacitors charged to high potentials for generating thrust and, more particularly, to an improved method and apparatus using a two-dimensional, asymmetrical capacitor to which a high potential is applied.

2. Background of the Invention

It is well-established in the literature that a force or thrust may be generated by a capacitor charged to a high potential. Although there are different theories regarding the basis for this phenomenon, there is no dispute that a force is generated by capacitors under such high voltages. However, the thrust generated by such high potential capacitors has been minimal and thus this phenomenon has had very limited practical utility.

Summary of the Invention

In accordance with the invention, an apparatus and method are provided for creating a thrust from a capacitor module system.

In accordance with a first aspect of the invention, a capacitor module system is provided for creating a thrust, said system comprising a capacitor module comprising a first conductive element having a cylindrical geometry; a second conductive element axially spaced from the first conductive element; and of a geometry having a smaller axial extent than the first conductive element; and a dielectric element disposed between the first conductive element and the second conductive element so as to form the capacitor module; and a high voltage source, having first and second terminals connected respectively to the first and second conductive elements, for applying a high voltage to the conductive elements of sufficient value to create a thrust force on said module inducing movement thereof. The first conductive element can comprise a solid cylinder or a hollow cylinder. The second conductive element can comprise a disk, a domed element, or a tip at the end of a dielectric rod. The system may further include a plurality circumferentially disposed, spaced dielectric rods interconnect the dielectric element and the second conductive element.

In accordance with a further aspect of the invention, an apparatus is provided for creating rotary motion, said apparatus comprising a rotor; a drive shaft driven by said rotor; and at least one capacitor module mounted on the rotor for imparting a thrust force to the rotor to cause rotation thereof, said capacitor module comprising a first conductive element having a cylindrical geometry; a second conductive element axially spaced from the first conductive element and having a geometry of smaller axial extent than the first conductive element; a dielectric element disposed between the first conductive element and the second conductive element so as to form the capacitor module; and at least one high voltage source, having first and second terminals connected respectively to the first and second conductive elements of at least one capacitor module, for applying a high voltage to the conductive elements of sufficient value to the thrust force.

Advantageously, the rotor may include at least two blades and a capacitor module is mounted on each of the blades.

In accordance with yet another aspect of the invention, a linear accelerator is provided, the accelerator comprising a support rail; a capacitor module comprising a first conductive element having a cylindrical geometry and a first sliding electrical contact; a second conductive element axially spaced from the first conductive element and of a geometry of smaller axial extent than the first conductive element and having a second sliding electrical contact; and a dielectric element disposed between the first conductive element and the second conductive element so as to form the capacitor module; a frictionless connection for connecting said capacitor module to the support rail for movement therealong; and a high voltage source, having first and second terminals connected respectively to the

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first and second sliding electrical contacts, for applying a high voltage to the conductive elements of sufficient value to create a thrust force on the module inducing movement thereof along the support rail. . .

Figure 1.

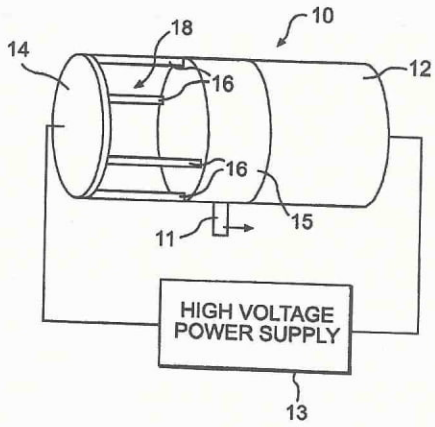


Figure 1a.

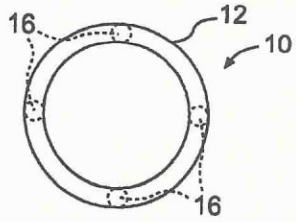


Figure 2.

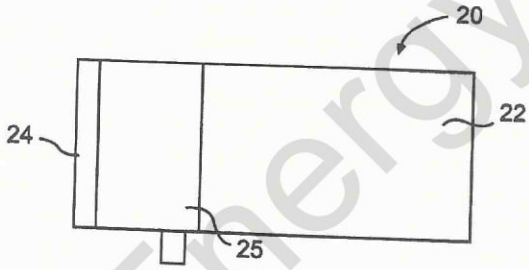


Figure 3.

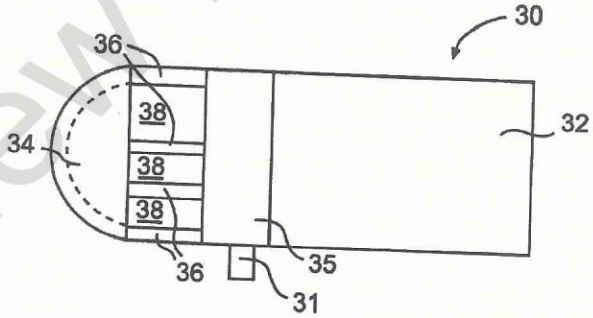


Figure 4.

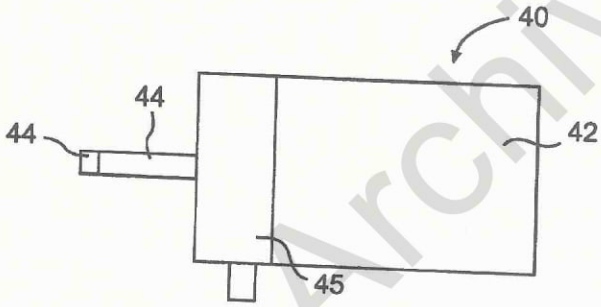


Figure 5.

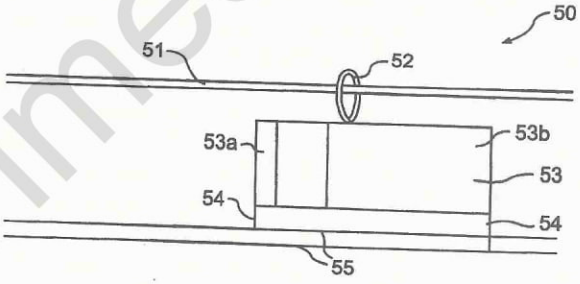
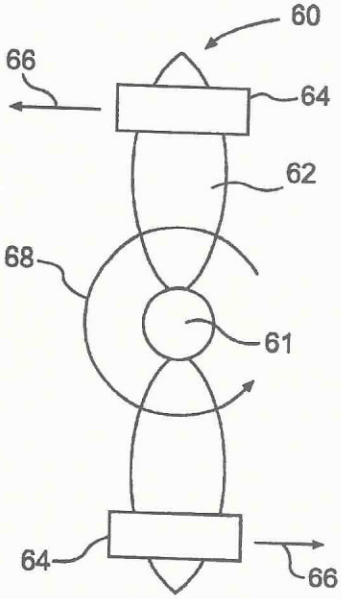


Figure 6.



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The Nature of the Nuclear-Active Environment Required for Low-Energy Nuclear Reactions

Edmund Storms*

Abstract

A collection of observations is used to characterize the nuclear-active environment required to initiate low-energy nuclear reactions (LENR).

Introduction

Nuclear reactions initiated in an atomic lattice at modest temperatures have been studied since the initial claims of Pons and Fleischmann (P-F).[1,2] However, the claimed effects have been hard to replicate. This paper will suggest that this difficulty is caused by a failure to properly identify the nuclear-active environment (NAE) with respect to its location and chemical structure. This paper will argue that the NAE is located in the surface region and that a reevaluation of attempts to produce the P-F effect, and theories based thereon, is required. In addition, the NAE has been assumed to be beta-PdD with a composition near its upper limit. This paper will argue that the NAE is a complex alloy, not beta-PdD.[1] (Beta-PdD is a face-centered cubic structure of the NaCl-type, which exists as a defect-structure between about $PdD_{0.7}$ and $PdD_{1.0}$, depending on applied pressure and temperature.) In addition, a variety of other methods found to produce the effect suggest several characteristics of the NAE, which might be universal to all methods.

We will start by making the assumption that most claims for low-energy fusion and transmutation are correct. Support for this assumption is readily available in the literature.[3-5] The challenge of this paper is to learn about the environment in which these nuclear reactions occur by assuming that the environment has universal characteristics common to all methods found to produce the effect.

Discussion

Where is the NAE located during the P-F effect?

The P-F effect is produced by electrolyzing a cathode of palladium in an electrolyte containing D_2O. A high average D/Pd ratio for the bulk cathode is required to produce anomalous energy, *i.e.* energy in excess of that applied to the cell.[6-8] Consequently, a great deal of effort has been devoted to increasing the amount of deuterium loaded into the entire cathode. However, diffusion theory predicts[9] and measurements show[10] that the highest composition is present at the surface. To the extent that composition is important, the nuclear reactions would be expected to occur first within the surface region. Indeed, measurements of open-circuit voltage, which is related to the activity of D+ in the surface, show that a critical surface activity is required to initiate energy production.[8,11] These arguments and observations focus attention on the surface as the region of nuclear activity.

Another indication that the nuclear effect occurs in the surface region is provided by behavior of helium production. Miles *et al.*[12,13] and Bush and Lagowski[14] independently measured helium-4 produced from active cathodes and found an amount in the gas consistent, within a factor of two, with the measured energy proposed to be caused by D + D fusion. However, Abell *et al.*[15] observed that He-3 produced from tritium decay in PdH can be removed as gas only if the material is heated above 1300°C. Consequently, for the amount of He-4 detected by the former studies to appear in the surrounding gas at room temperature, the He-4 would have to be produced very near the surface, as the former authors concluded.

Direct proof of heat production in the surface region was obtained by Mosier-Boss and Szpak[16] who observed, using an IR camera, many individual hot spots on a nuclear-active cathode. Physical examinations of many cathode surfaces show melting in very small spots within the surface region.[17-20] Jiang *et al.*[21] placed small slits in the edge of a palladium cathode and found anomalous elements, some of which were radioactive, at these locations after extended electrolysis in D_2O. When evidence for nuclear transmutation is reported, anomalous elements are only found in the surface region with diminished concentration away from the surface. A number of studies have measured weak radiation using autoradiograph that produces spots on a film in contact with previously active palladium or titanium.[22,23] These observations provide direct proof that nuclear activity occurs within the surface region.

What are the unique characteristics of the NAE?

Once the surface region is accepted as being a source of anomalous energy, the characteristics of this region need to be understood. Electrolysis of long duration creates a very complex surface[24-36] involving many different elements, including a high concentration of lithium.[26,37-41] As a result, the active surface region is a complex alloy, which can even be palladium-free.[42] Some of these elements are proposed to result from contamination, and some from nuclear reactions. Besides being a complex alloy, the near-surface deuterium content is significantly in excess of

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D/Pd = 1.0,[10,43-46] the upper limit of the beta-phase.

Application of thin layers to inert substrates is also found to produce anomalous energy. Storms[47] produced an active region as thin as several microns on platinum, a layer that does not involve palladium. Miley found similar results when thin films of various metals were applied to glass.[48] When palladium is present, the thin layers are found to be active without extensive electrolysis, as required of bulk palladium.[49] Clearly, the universal focus on pure beta-PdD, as being the nuclear-active material, has been misplaced. Indeed, every attempt to make the palladium cathode and electrolyte as pure as possible has failed to produce anomalous energy. On the other hand, addition of aluminum to the electrolyte is found to increase success.[14,50] Bulk aluminum subjected to several treatments including electrolysis is claimed to show evidence for nuclear activity.[51,52]

Other methods to initiate the effect suggest the importance of microcrystals. Warner and Dash[53] found excess heat using a Ti cathode in a sulfuric acid electrolyte. In this case, the effect was only observed when a fine powder of TiD_2 was formed at the edges of the cathode, a powder that gradually fell off and settled to the bottom of the cell. Palladium was also found to form microcrystals on the surface during electrolysis.[33] The Case,[54] and Arata and Zhang[55] effects, which use finely divided Pd, make the importance of microcrystals clearer. Arata used palladium-black, which is a fine powder of palladium containing a range of particle sizes in the submicron to micron range. Sintering during processing makes the exact particle size uncertain and variable. They reacted the powder with very pure D_2 gas at room temperature and observed excess heat and helium production. Case used finely divided Pd deposited on carbon (a commercial hydrogen catalyst based on Pd applied to charcoal was used) and subjected the material to D_2 gas at about 200°C. In this case, the average particle size is about 30 nanometers. Both studies were duplicated by McKubre *et al.*[56] In both cases, the palladium would have contained an unknown collection of impurities having an unknown concentration. The small size[57] and presence of impurities will significantly increase the expected D/Pd ratio. These observations support the proposal that finely divided material is part of the NAE.

A very important observation has been reported by Iwamura *et al.*,[58] which can be interpreted as involving very small domains of a palladium alloy. They sputter-deposit alternate layers (1000 Å) of CaO and Pd on a Pd substrate. This was covered with a thin layer (400 Å) of Pd, into which Cs or Sr were electrodiffused from an electrolytic solution. When D_2 gas was allowed to pass though the assembly, the deposited Cs was converted to Pr or, in separate experiments, the Sr was converted to Mo. These reactions were observed within 20 Å of the surface into which the Sr or Cs had been diffused. The question is, what was the nature of the environment within this thin region? Important to an answer is the observation that the CaO was essential for the effect to occur even though it was well below the region where the nuclear reactions were observed. Logic requires CaO to have an effect only if it can change the nature of the structure within 20 Å of the surface. This could be accomplished if the 400 Å layer of Pd is forced to crystallize into microcrystals having the required nanometer dimensions. The process would involve epitaxial growth from exposed Pd located between CaO particles at the base of the 400 Å layer. (Epitaxy is a process in which a layer applied to another material grows with a crystal orientation which is an extension of the crystal orientation in the base material. As a result, the 400 Å layer will grow on the small exposed Pd surfaces located between the CaO crystals, thereby transferring this grain structure to the surface.) These microcrystals would be a complex alloy of Sr or Cs in Pd, which would be converted to an unknown deuteride structure having an unknown but high D/Pd ratio. In addition, the reaction rate for transmutation would be expected to be proportional to the fourth power of the deuterium concentration. Therefore, most of the transmutation should occur very near the surface. However, this work also shows that the very high surface concentration of deuterium obtained in an electrolytic cell is not required to produce transmutation. This method is important for characterizing the NAE because a single additive in Pd is shown to make the metal nuclear-active without the usual confusion caused by many impurities.

Conclusion

During past attempts to increase the average deuterium concentration in the bulk palladium cathode, considerable effort has been applied to measuring and modifying the surface composition of a P-F cathode, in an attempt to increase the amount of deuterium in bulk palladium. The assertion made here is that this was doomed to be unproductive, because the complex surface layer is the actual site of all nuclear activity. Bulk PdD is inert and is only required to support a high deuterium composition within the impurity layer. If this assertion is correct, platinum becomes a better choice of substrate, because this metal does not easily absorb deuterium and does not form cracks, thereby preventing deuterium from being lost from the back side of the deposited layer.

When a thin palladium layer containing suitable impurities is applied to platinum or silver, anomalous energy is frequently seen immediately upon start of electrolysis. This is in contrast to the long delay needed to achieve energy production when bulk palladium is used. This long delay is proposed to involve slow deposition of suitable impurities, rather than slow loading of bulk material. Because such a surface layer is not easy to control, the effect has been difficult to reproduce.

A submicron size, possibility near 30 nanometers, appears to be required for the NAE to operate. This suggests the need for an environment in which quantum effects are possible. In addition, when Pd is present, the active material is a complex alloy of Pd with an unknown but high D/Pd ratio. If the experience reported by Iwamura *et al.*[58] is assumed to be universal, the target nucleus would appear to exist as a minor impurity within a uniform lattice of inert material. In a conventional P-F experiment, many impurities are present and these diffuse into the Pd from the electrolyzing surface. Because the surface is very heterogeneous, these impurities are present in a variety of compositions and combinations. Hence a large number of transmutation products are expected and detected. Conditions can be imagined where Pd is a minor impurity within another inert lattice, whereupon it becomes the target nucleus.

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The author realizes these observations have been and can be interpreted in different ways. The purpose of this paper is to focus attention on one more interpretation that might be more useful than past models. Previous models have failed to provide a useful understanding of how to create the NAE, perhaps because they have focused on the wrong material. Perhaps a new approach would be more productive.

Proposed Future Approach

Once the NAE is accepted as being of a small size and made from a complex alloy of various elements, perhaps including palladium, methods required for replicating the effect can be suggested. The most obvious method is to use techniques developed by the microelectronic industry, which can deposit controlled amounts of material onto very small regions. Such methods would allow the particle size to be controlled as well as having the ability to apply known amounts of various elements. Once the range of variables affecting the NAE is understood, a large amount of active material could be easily made. In addition, a correct model for explaining the unique nuclear reactions could be developed based on such knowledge. In the absence of this approach, present efforts are handicapped by having to create the NAE using random processes, which is a very inefficient method. The Iwamura *et al.*[58] study shows what can be accomplished when suitable tools are applied to the problem.

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* See the author's biography and contact information on page 51.

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Testing Update

NEW ENERGY
Research Laboratory

Eugene Mallove

As Ken Rauen related in this column in our last issue, proprietary projects (not within the cold fusion/LENR area) are now the central focus of NERL efforts. We are also performing consulting work now on a number of fronts—especially in advanced emerging conventional technologies that will be helpful to the environment and energy situation.

At present, we are taking a break from efforts to find and market cold fusion/LENR demonstration devices. We at NERL are reassessing the field. The cold fusion field itself has had, by and large, little interest or enthusiasm for the critical demonstration device goal, and it is not within our financial or time constraints to develop such devices "from scratch." The main focus of virtually all cold fusion researchers, it seems to us, is to conduct basic scientific research, publish papers, and attend cold fusion conferences. These researchers wish to wait for the day when the knowledge base and understanding of LENR is great enough to deal with technological devices. Moreover, cold fusion research is at present significantly empirically based and not especially amenable to *predicting* new physical systems in which the nuclear-scale excess heat phenomenon will emerge. (This is not so, for example, in the work on hydrino physics that is being carried out at BlackLight Power Corporation. A review of the technical papers posted on its website, www.blacklightpower.com, suffices to show that.)

Others are presently circulating business plans that would attempt to take some of the better cold fusion experiments and commercialize them as costly "workstation" test beds in an effort to ignite wider interest in cold fusion/LENR. That is a good idea and we wish them well, but it would be much better, I think, if smaller capital resources were sought such that these devices could be marketed immediately to industrial laboratories. These companies could be interested in entering the field if they saw clear, hands-on evidence of the nuclear-scale excess heat phenomenon.

This "bootstrap method" has its problems, of course: it requires basic capital to put together systems for sale that are costly relative to the typical cold fusion investigator's resources. And, success is not assured. The all-important power ratio—ratio of output to input power—may not be "sexy" enough in most cold fusion work to entice even some open-minded industrialists to embrace the field. Look at Mitsubishi Heavy Industries, as an example. It has one of the world's best, repeatable LENR experiments *in house*, yet there is no evidence that it is about to charge off to develop LENR/cold fusion technologies. The Mitsubishi investigators have all they can do to convince their management to allow them to continue their present work.

There are severe limitations in a one to two person laboratory facility (NERL) to adequately address the variety of devices that should be looked into with the thoroughness that they deserve. We are proud that through a sometimes painful learning process we have so far explored territory that gives us a good idea of what is likely to be promising and what not. This is a good foundation for the future. From now on, our standard for hands-on examination of devices from the outside will be much higher. We will first have to be shown *compelling* evidence for over-unity conditions. We will not be in the business of finding the gross (or subtle) mistakes of others.

From now on we will concentrate our efforts on devices that already have predictable, quantifiable effects based on several lines of advanced physical theory. As special funding for these efforts allows, we will be working on proprietary device technologies in two areas: 1) What we call "advanced thermodynamics"—energy devices that are under the rubric of extensions and modifications of the "Second Law," and 2) Other devices that are *not* within the New Hydrogen Energy Physics (NHEP) paradigm (cold fusion, LENR, hydrino), which at first appearance are purely electrical in character. NERL has filed its first patent in the first of these areas. Demonstration devices (based on ones that work robustly already) are already possible, but must be withheld for now until patent application issues are resolved and additional dedicated funding for this direction is acquired. Interested parties with significant interest in and knowledge of the boundaries of conventional thermodynamics may wish to learn about this work under a tight Non-Disclosure Agreement.

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Models of the Electron

David L. Bergman

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Before the end of the nineteenth century, J.J. Thomson was able to demonstrate the existence of a small particle that is named the electron. It has a small and definite amount of electric charge and a small and definite amount of inertial mass. Leading scientists of the day promptly developed models for the electron and performed experiments to validate their ideas. The classical physicists believed that the electrical particle they discovered was a fundamental building block of matter—what we would call an *elementary particle*, and that electrons were contained in ordinary objects that we observe every day.

Some classical physicists also believed that electricity and magnetism could account for the physical properties of matter, such as inertia, the color of objects, the gravitational force between masses, and the crystalline structure of certain molecules. In other words, a concept developed that matter has an electromagnetic nature that explains what is observed about matter.

For over one hundred years, physicists have realized that an understanding of electrons is important for the development of science. A majority of physicists adopted *relativistic mathematics* and a *law of chance* as guiding principles to predict natural phenomena. A small minority, mostly ignored, continued to look for order in the universe with models and theories based on *causality* and a conviction that a description of matter in physical terms could be discovered and validated.

Historical Models

Several models were soon proposed for the electron discovered by J.J. Thomson in 1897. Electric charge compressed to the shape of a *sphere* or a *ring* were proposed and evaluated on the basis of classical electrodynamics. In the years that followed, a new quantum theory evolved that integrated the *point electron* and the *quantum electron* into the Standard Model of Elementary Particles.

The earliest model of the electron consisted of charge distributed over the surface of a small sphere. From the known mass, which was assumed to be of electromagnetic origin, a "classical electron radius" of 2.82×10^{-15} meters was calculated. Max Abraham advocated a perfectly *rigid sphere*, while H.A. Lorentz proposed a *deformable sphere* that contracted in accordance with its velocity. Neither was aware of the electron's spin (angular momentum) or magnetic moment, and their non-rotating spheres therefore made no attempt to account for these features.

For four reasons, a *spherical* electron is untenable:

1. Strong Coulomb forces from charge concentrated in a small area would make the electron explode.

2. No force has been found to balance Coulomb forces at the surface of a spherical electron.

3. To produce the observed magnetic moment of the electron, a rotating sphere would need a peripheral velocity far in excess of the speed of light.

4. The mass-energy equivalence of electric charge on a sphere provides only 75% of the electron's effective mass: *i.e.*, $E_o = (3/4)\, m_o c^2$.

Another classical model was proposed for the electron by Parson[1] in 1915. His model consisted of charge distributed over the surface of a *spinning ring*. While the sphere has only one degree of freedom, radius R, Parson's spinning ring has three degrees of freedom, radius R, half-thickness r, and rotation rate ω, providing more opportunity for characteristics of the ring model to conform to the electron's measured parameters. As a proposed basic constituent of ordinary matter, the spinning ring model electron gave promise of explaining many of the properties measured in various materials. At a meeting of the Physical Society of London held October 25, 1918, Dr. H.S. Allen, MA, D.Sc., University of Edinburgh, presented "The Case for a Ring Electron."[2] At this meeting, "Dr. H.S. Allen discussed the arguments in [favor] of an electron in the form of a current circuit capable of producing magnetic effects. Then the electron, in addition to exerting electrostatic forces, behaves like a small magnet. The assumption of the ring electron removes many outstanding difficulties. . ."

Dr. Allen's presentation described the advantages of the ring electron. Although Parson's ring electron had features to be taken seriously, and explained more phenomena than any other model, its advocates relied on estimates and even erred in listing some of its properties. Most notable was the value given for its spin, a value equal to $h/2\pi$ where h is Planck's constant, instead of the empirically correct value of one-half this amount. Perhaps for this reason, or for other reasons not stated, most scientists today adopt the Standard Model, which considers the electron to be a quantum object with particle-wave duality.

As a *particle*, the *point model* of Quantum Theory (QT) eliminates the spatial extent of the previous models "by a process of direct omission or subtraction of unwanted terms." As stated by P.A.M. Dirac, the aim is "not so much to get a model of the electron as to get a simple scheme of equations which can be used to calculate all the results that can be obtained from experiment." The point model is

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actually a *mathematical model* and is "not based on a model conforming to current physical ideas."[3]

Like the spherical models, the point model is physically unstable. Worse, it requires the density of the particle's rest mass energy to be *infinite. According to the laws of electrodynamics, a point particle with the known charge measured for an electron would have to have zero spin and zero magnetic moment and would immediately fly apart due to the Coulomb repulsive force.* Rather than discard the point model for its erroneous predictions, the model is *endowed* with the empirically correct fundamental properties by *proclamation*, giving credence to a cynical view wherein modern science has accomplish more by consensus and fiat than by logic.

Under the vivid imagination of modern "scientific" leaders, the point model persists in current scientific literature—being incorporated into quantum electron theory—and has become the dominating electron theory of our day.

The modern concept of a *quantum electron* exhibiting wave-particle duality has been set forth by Bohr, Dirac, Heisenberg, Schrödinger, deBroglie, Born, Feynman, and others. According to this model, "a non-relativistic free particle, of energy $E = mv^2/2$ and angular momentum $p = mvR$, is associated with a wave of frequency $\nu = E/h$ and wavelength $\lambda = h/p$."[4] This wave, or a set of waves that form a wave packet, is mathematically described by the Schrödinger wave function expressed by $\psi\ (x,t)$. A physical interpretation of the Schrödinger wave function was formulated by Max Born and "states that the quantity $\psi^* \psi' = |\psi|^2$ is to be interpreted as a *probability density* for a particle in the state ψ." This description of the quantum electron is essentially a mathematical construction with only a tenuous link to a physical interpretation or a physical structure. The question of electron *stability* is simply disregarded as not relevant, since the essence of the model is mathematical and not physical.

Many scientists have concluded that none of the historical models provides a satisfactory explanation of the observed features of the electron. The *McGraw-Hill Encyclopedia of Science and Technology* states that:

> . . .a good theory of electron structure still is lacking . . .There is still no generally accepted explanation for why electrons do not explode under the tremendous Coulomb repulsion forces in an object of small size. Estimates of the amount of energy required to "assemble" an electron are very large indeed. Electron structure is an unsolved mystery. . .[5]

Properties of Electrons

Various observations of electrons have revealed their major properties. A successful model must be in agreement with these properties.

Charge: The electron carries (actually, consists of) one unit of charge e, considered by convention to be negative in order to relate to the positive charge of the proton.

Stability of the Free Electron: As a free particle, isolated from other particles, the electron is stable. As far as is known, this stability is for an indefinite period. Since like charges repel, some binding force is required to hold the electron together. Classical theory must explain electron stability on the basis of the laws of electricity and magnetism; QT is content to specify that the electron is *inherently stable*.

Stability When Bound in an Atom: As a particle bound in an atom or molecule, the electron is also stable. This invalidates the Bohr model of the atom because an orbiting electron has no orbital stability mechanism and would suffer "radiation death" from the continuous centripetal accelerations of the charged particle.

Mass-Energy: Each electron has a mass and a mass-equivalent energy related by Einstein's equation, $E = mc^2$. By applying electromagnetic theory to the ring electron, the energy is described as residing in the electrostatic and magnetostatic fields that give shape to the particle. QT regards the mass as an *inherent property* of the electron.

Magnetic Moment: Each electron has a fixed magnetic moment equal to the product of its area and current. For a ring electron, the magnetic moment may be calculated as $\mu = \pi R^2 I$. QT regards the magnetic moment as an *inherent property* of the electron.

Extent (size): There is much confusion about the electron's size. Although Dirac considered the electron to be a point of zero extent, his purpose was for mathematical convenience and not intended as a physical description. Some quantum theorists write about Dirac's point electron as though this is the actual size,[6] and others describe a point-like model. According to classical physics and the laws of magnetism, *the electron must have some physical extent in order to have a magnetic moment.* As early as 1919, Arthur Compton performed scattering experiments to determine the size of the ring electron.[7] Hofstadter measured the charge distribution of neutrons and protons and received a Nobel prize in physics for his work (1961), providing strong evidence that these particles have a non-zero size.[8]

Spin: The spin (angular momentum) of an object is equal to mvR where m is the mass rotating with velocity v at a radius R about the axis of rotation. Experiments have established that the spin of an electron is non-zero and stays constant at a value equal to $h/4\pi$, demonstrating a finite size for the electron (*i.e.*, $R > 0$). Quantum theorists often specify a point charge of zero size and deal with this contradiction by claiming that the laws of classical physics do not apply to elementary particles and that the spin of an elementary particle is an *inherent property*.

Gyromagnetic Ratio: This ratio of spin to magnetic moment has been carefully measured and found to be slightly anomalous, *i.e.*, the $g/2$ factor is slightly larger than one. Until recently, there has been no classical explanation for the

Quantum Electron

Physically, an elementary particle is regarded as a stable, point-like, structureless entity (structureless except for having mass, spin, and other possible quantum numbers) which in its free state moves on a world line with momentum *k*.

—John Fang, California State Polytechnic University at Pomona in *Physics Today*, p. 90, July 1997.

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anomaly. QT claims the anomaly is the result of radiative transitions: emission of photons when an orbital electron spontaneously changes energy states—wherein two violations of logic occur: (1) stability of the atom *postulated against the known loss of energy* (called "radiation death") by an orbiting electron and (2) *assumption of spontaneous events* governed by the law of chance (Heisenberg Uncertainty Principle), which is never observed in ordinary experience and now *shown to be false by empirical evidence.*[9]

Inertial Mass: Since the electron detection experiment by J.J. Thomson, physicists have known that the electron has an inertial mass that tends to resist attempts to change its velocity. By applying classical electrodynamics to the ring electron, we recently found a *cause* for the inertial force in the electromagnetic fields surrounding an accelerated electron.[10] QT regards inertial mass as a fundamental, *inherent property*.

Particle Characteristic: The electron is generally classified as an elementary particle (not composed of other particles). Certain phenomena, such as the photoelectric effect, fluorescence, and the Miliken oil drop experiment, show that the electron has a small and quantized amount of mass and charge, indicating a particle with a *boundary* and a *location*. QT denies the boundary (an *observed* electron is said to be a point! how can anyone see a point?) and specific location, claiming instead that the product of an electron's location and momentum is at least as varied over time as the magnitude of Planck's constant in the Heisenberg Uncertainty Principle.

Wavelike Characteristic: Diffraction and interference experiments show that sometimes an electron demonstrates the properties of waves. These observations seem to contradict the particle characteristic. If an electron is a point particle without fields, *its range of influence on another particle is limited*; as a wave, an electron can exert influence over a long range, reaching beyond its boundary to *accomplish "actions at a distance."*

These incongruous properties lead to QT's claim that the electron has a *dual nature*: Which nature is exhibited depends upon the experiment performed. Neils Bohr argued that the electron could be either a particle or a wave, provided it was not both at the same time [11, p. 299]. Prominent quantum theorists accept the notion of dual essence of the electron and state that human contemplation or measurement of a quantum wave causes the wave to "collapse." "According to. . .John von Neumann . . .and Eugene Wigner. . .no apparatus or measurement scheme, no matter how sophisticated and complicated, could by itself ever cause the 'collapse' of the wave function. It is only when the result of the measurement is registered and recorded in the mind of a human being—an animal, even a highly developed one, will not do—that the wave function 'collapses' into an observable reality." (11, p. 280). (The character of this claim is metaphysical rather than scientific.)

Other QT experts claim that "Nature" causes the wave collapse, ascribing the power of changing its essential nature to the electron itself. For this reason, QT is classified as a *material* or *pantheistic* philosophy. Some even deify nature with a capital "N" or a name such as the Greek goddess of the earth, "Gaia."

Until recently, classical theoretical approaches offered no explanation for the wavelike property (although writings on Parson's ring electron hinted at a classical explanation). We now know that the ring model of the electron as a loop of circulating current will resonate with standing waves that are constrained to a multiple number of wavelengths (with peaks and nodes of electromagnetic field intensity) formed around the circumference of the ring. Also, the classical electrodynamic behavior of the ring electron's fields provide a causal explanation for the wavelike phenomena observed (*e.g.*, electrons in a double slit experiment).

Electron in an Atom

Another convenient and useful representation, often preferred by chemists. . .depicts an electron as spread out in a kind of charge cloud, the density of which corresponds to the local probability of presence of that electron.

—Bernard Pullman, *The Atom in the History of Human Thought*, page 280, Oxford University Press (1998).

Technological Benefits: Over one hundred years have passed since the electron was discovered. The technology of Electric Field Theory has delivered electric light bulbs, electric motors, radar, electronics, communications, and computers. Many laws of electricity and magnetism have been researched, documented, and taught throughout the world.

Billions of dollars are invested in high-tech accelerators and colliders for quantum theorists to learn more about the electron. And yet, despite tremendous efforts over the last nine decades, modern physics still has not developed an accepted model to explain the stability or structure of the electron. The models and theories offered violate logic and force defenders of QT to abandon the Scientific Method and adopt a philosophy that attempts to predict natural phenomena without explanations—and gives preference to mathematics models over physical models of physical reality.

Quantum theorists continue to be embarrassed by the lack of practical applications that provide human benefits from their theories. If compelled, three applications are cited: the laser, the Scanning Electron Microscope (SEM), and transistors.[12] But functions of these devices depend upon electromagnetic fields, not quantum tunneling. In its article on the laser, an acronym for Light Amplification by Stimulated Emission of Radiation, the *McGraw-Hill Encyclopedia of Science and Technology* inserts the word "electromagnetic" before "Radiation" and explains that "lasing" is stimulated by coherent (phase related) electromagnetic fields, not by randomly emitted photons or any other function ascribed to QT.

The second claim of applying QT to develop the SEM, made to me personally by a Nobel Laureate in physics, attributes the so-called "quantum tunneling effect" as the means of acquiring the microscopic image by electron tunneling between the specimen and a tiny probe of the microscope. But recently, research at the Naval Research Laboratory revealed that the so-called "quantum tunneling effect" is controlled by a *magnetic field*:

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NRL's Stuart Wolf, who spoke at the APS March Meeting in Los Angeles. . . described. . .effects. . .in which the electrons experience in a multilayered material can be substantially altered by the *magnetic field* within the material, and *spin dependent tunneling, in which an electron can move through a normally impenetrable barrier if it has the tight spin value*. The movement of an electron in a circuit can also be manipulated by properties other than its charge [emphasis added].[13]

Properties of the Spinning Ring Model

Is it possible to develop a model of the electron based on Classical Electrodynamics that agrees with the known characteristics of the electron? Yes. The spinning ring model of the electron has properties that match measured features of the electron.[14] The following sections describe how the spinning ring model was logically *derived* from the electron's measured characteristics.

Balanced Forces: For the electron to be stable, forces on every part of its surface must be in balance. But the electron is a small charged particle, and charges of like sign repel themselves. The model must show why the electrostatic Coulomb force from the electron's charge does not cause its surface to fly apart.

Binding Force: What holds the electron together, keeping charge compressed in a small volume? This "binding force" must be as strong as the repulsive electrostatic Coulomb force. Suppose that elementary particles have the shape of a small sphere, as proposed by Abraham and Lorentz. The electrostatic charge would move to the surface of the sphere, being repelled from the sphere's interior by the mutual forces of repulsion between elements of the electron's charge. This provides the particle with a minimum amount of potential energy for a given radius of the sphere. Corresponding to this potential energy is an equivalent mass which must equal the measured electron mass.

Proton Binding Force: Whatever model is suitable for an electron should also be suitable for a proton. Since the proton's mass and mass-equivalent energy is about 1,836 times the electron's mass and energy, the proton sphere would have to be much *smaller* than the electron. *Compressing the proton charge to a smaller area gives it more potential energy*, just as compressing a spring to a smaller size adds potential energy. Somehow, the binding force that compresses elementary particles must compress a proton more than the larger electron.

Unsuitable Binding Forces: Which of the recognized forces could possibly act as a binding force to provide an equal and opposite force to the *electrostatic force* of repulsion? Certainly not *gravity*, which is far weaker than the electrostatic force over the same distance. The electron is stable outside the nucleus, beyond the domain of the *strong force*, and the *weak force* is said to cause disintegration; so neither of these forces can provide the electron binding force. This leaves only one other known force that can act as a binding force—*magnetism*.

Magnetic Pinch Effect: Magnetism has the essential characteristic—a force of *attraction* between parallel current elements. Ampere's law tells us there is a force of attraction between two wires carrying current in the same direction. This force is called the "magnetic pinch effect" in order to describe the "squeezing" force exerted on moving charge.

Analysis of a Spinning Charged Sphere: Magnetism occurs only when charge is moving. The strength of a magnetic field is proportional to the charge *velocity*, and the magnetic force exerted on another moving charge is proportional to the *velocity* of the second charge. Now a charged sphere in rotation has its maximum rim velocity at the equator and is compressed by the magnetic pinch force in the equatorial zone.

But at the poles of the sphere there is no tangential velocity and no magnetic pinch effect. This means that the sphere is an unsuitable model for the electron because the electrostatic and magnetostatic forces at its surface can only be balanced at one latitude. For any given rate of rotation, all latitudes of the sphere except one (at the equator) will have an attractive inward force from magnetism that is weaker than the constant outward force from electrostatic charge on the sphere.

Shape of the Electron: This analysis of the spinning charged *sphere* shows that it cannot be stable and is therefore unsuitable as a model for the free electron. The model must have some shape such that a rotation gives all its parts a constant velocity. *Only one possible shape meets this requirement: a very thin ring* (*i.e.*, the ring must have a thickness radius r that is small in comparison with the ring radius R).

Rotation Rate: The spinning charged ring has a Coulomb force attempting to expand its thickness and a magnetic pinch force attempting to compress its thickness. At one rate of rotation ω, the two forces will be equal in magnitude and the net force on charge at the ring surface will be equal to zero. A calculation shows that the balanced condition occurs when the tangential velocity at the rim of the ring equals the speed of light c. Thus, for stability, the rotation rate must have the value $\omega = c/R$.

Ring Parameters: In addition to holding one unit of charge e on its surface, the ring model has three physical parameters. These are its radius R, its half-thickness radius r, and its rotation rate ω. These four parameters can be selected to match four fundamental characteristics of the ring, which are usually considered to be its mass, charge, spin, and magnetic moment. However, when the four ring parameters are adjusted to these fundamental characteristics of the electron, the model agrees with the various and sundry properties listed earlier for electrons.

Electric Fields of a Spinning Charged Ring: The spinning charged ring has two electric fields: an *electrostatic field* emanating from its charged surface and a *magnetostatic field* from the ring current loop. While the spatial distribution of energy differs for the two fields, they have two common features: (1) the fields are *stationary*, being fixed to the location of the ring and (2) the fields do not vary with time and are therefore *static*. As a result, no radiation of energy into space is possible. If the charge does *not* occupy the ring continuously, as in the *orbiting* electron in the Bohr model of the atom, radiation occurs from the moving charge. *But when the charge is distributed uniformly over the surface of a ring, no radiation occurs, permitting the energy and dimensions of the electron to be stable.*[15] With no radiation of energy, a rim velocity equal to the speed of light is possible and does not violate any known principle of science. Later, it will be shown that this particular velocity is required by electromagnetic theory and observation.

Calculating Ring Parameters: The three physical parameters of the ring can be calculated from three known facts or conditions. The rotation rate ω was obtained from the require-

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ment for dimensional stability, leaving two other parameters, radius R and half-thickness radius r, to be calculated.

Radius of the Electron: The radius of the free electron is easily found from measurements of its magnetic moment μ since $\mu = \pi R^2 I$ Using $I = \omega e/2\pi$ where the rotation rate $\omega = c/R$ provides the relationship between radius and magnetic moment, $R = 2\mu/ec$. The calculation shows the radius of the free electron is 3.86607×10^{-13} meters. The radius can also be specified as $R = h/2\pi mc$ so that the circumference of the ring is seen to equal the deBroglie wavelength.[14]

Half-Thickness of the Electron: The potential energy stored in the fields surrounding a free electron has two components: electrostatic energy from the *location* of charge stored on the ring surface and magnetostatic energy from the *rotation* of the electron charge. The energy stored in these fields of potential energy depends upon the half-thickness of the ring, as well as its radius and rotation. The latter two parameters have been determined for the electron, so the half-thickness r of the ring can be calculated from the electron's potential energy, $E = mc^2$ where m is the measured mass of the electron. By this approach, the half-thickness r of the ring is calculated to be $\ln (R/r) = (8 \pi^2 \varepsilon_0 \mu m c) / e^3 \; 1\text{–}3 \ln 2$ where $\ln (R/r)$ specifies the shape of the ring. It has been shown that $\ln (8R/r)$ is approximately equal to π/α where α represents the fine structure constant.[14]

As the previous equation shows, the *shape* of the ring, R/r, remains constant—even when magnetic flux ϕ links the ring with another nearby particle (*e.g.*, in a nucleus). The ring remains *rigid* because forces acting normal to the surface are much greater (by a factor of about 10^{15}) than forces that establish the ring radius. A calculation shows that the ring is very thin, r being much smaller than R.

Conservation of Magnetic Flux: It has been shown that the total magnetic flux ϕ passing through the ring remains constant.[16] By Faraday's *law of magnetic induction*, the ring reduces its radius R and thereby adjusts its self-induced flux when external flux is added from a second charged ring.

Planck's Constant: For a spinning charged ring, *the product of electric charge q and magnetic charge ϕ remains constant with the value h (Planck's Constant)*.[16] This is true for any system of rotating charge—a relationship that students of J.J. Thomson had to prove.

Since Planck's constant h is directly related to the fine structure constant α, the *shape of a ring* may be expressed in terms of either constant. To some, this physical relationship may be more meaningful than the electrical relationship $e\phi = h$. In either case, the reader should recognize that *any theory which predicts a fundamental constant is superior to another theory that uses it but does not predict it.*

Ring Characterization: We may observe here that the ring model of the electron is fully characterized. Its four parameters—one unit of charge distributed over the surface of the ring, and its three physical parameters: rotation rate ω, radius R, and half-thickness r—have been calculated. These four parameters lead directly to the four fundamental characteristics of the electron as well as several other features of this elementary particle. This spinning ring model of the electron has a size, a shape, and a structure.

Magnetic Moment: The radius of the spinning ring was obtained above from observations of the electron's magnetic moment; therefore, the spinning ring model is in agreement with the electron moment.

Spin: The spin, or angular momentum, of an object in rotation is given by the product of three parameters mvR. The ring spins with tangential velocity c at a radius $R = h/2\pi mc$. The rest-mass of an electron is almost equally divided between its electrostatic and magnetostatic energies.[14] For the calculation of spin, only the contribution from magnetostatic energy is included, corresponding to the *motion* of charge in the spinning ring. Thus, only one-half of the electron's energy contributes to its "motional mass," and the calculation provides the correct value of electron spin, $p_s = h/4\pi$. This explanation for only one-half unit of the angular momentum instead of a full unit was first given in 1990 *and is the first explanation of the electron's spin based on reasoning from physical properties*.[14]

Gyromagnetic Ratio: The ratio of magnetic moment to spin is known as the gyromagnetic ratio and is approximately equal to 2 (relative to e/m) because of the equipartioning of electrostatic and magnetostatic energy described above. Actually, the gyromagnetic g-factor has been measured very accurately and found to be a little larger than 2. The physical explanation of this anomaly is found in the fact that the magnetostatic energy is slightly less than the electrostatic energy (see Table 1) and less than one-half of the total rest mass energy of the electron. The magnitude of the magnetic moment depends upon the exact distribution of charge throughout the interior of the ring. In the simplest ring model—a current loop—a negative constant in the equation for inductance of a ring leads to less magnetostatic energy and a smaller magnetic ratio.[14]

Inertial Mass: Russell Humphreys showed that an electric current resists attempts to change its velocity due to the reaction force on the current by the fields generated if the current is accelerated.[17] By a similar analysis, it has been shown that electrostatic charge has an associated inertial mass. In the spinning ring model, the contributions to inertial mass from the charge and current are equal. If the charge is distributed in a thin layer at the surface of the spinning ring, the spinning ring has the same value of inertial mass that has been measured for the electron.

Particle Characteristic: The electron is a particle because it has a definite shape with sharp, well-defined boundaries. It also

Table 1. Properties of the Free Electron

Charge, e	1.60218×10^{-19}	Coulomb
Mass, m	9.10953×10^{-31}	kilogram
Magnet moment	-9.2848×10^{-24}	J/T
Radius, R	3.86607×10^{-13}	meter
Shape, $\ln(R/r)$	429.931	-
Rim speed	c	meter/s
Rotation, ω	7.75445×10^{20}	rad/s
Current, I	-19.773	Ampère
Capacitance, C	3.1281×10^{-25}	Farad
Inductance, L	2.0891×10^{-16}	Henry
Magnetic flux, ϕ	-4.1309×10^{-15}	Weber
Static energy	4.10312×10^{-14}	Joule
Magnetic energy	4.08412×10^{-14}	Joule

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Two atoms run into each other on the street.

One says to the other, "Are you all right?"

"No," says the other one. "I lost an electron!"

"Are you sure?" his friend says.

"Yeah," he replies. "I'm positive."

—(a little EE humor)

possesses a precise amount of charge, one unit, and a precise amount of inertial mass corresponding to its size, shape, and the potential energy in its electromagnetic fields. These two features, *charge* and *potential energy*, define its particle and material characteristics in contrast to radiated energy (light, gamma rays, etc.) which propagates without the presence of charge.

Wavelike Properties: It is well known since the suggestion by deBroglie and verification by Davisson and Germer and by G.P. Thomson that the electron also has a wavelike property. The wave property follows naturally from the ring model, which has a circumference equal to the deBroglie wavelength. Furthermore, the ring, being an electric circuit or current loop, has a definite capacitance C and inductance L. The ring functions as a transmission line in a continuous loop with resonant frequency given by $\omega = 2\pi/(LC)^{1/2}$ and a standing wave consisting of electrostatic and magnetostatic fields. The relative velocity between the electromagnetic fields and the ring charge is, of course, the velocity of light c, as required by Maxwell's theory. In order to sustain the standing wave, a multiple or sub-multiple of the wavelength of the standing wave must equal the circumference of the ring so that the ring radius has a constant value $R = h/2\pi mc$.

Spectra: Using the resonance property of the ring, C. Lucas and J. Lucas have shown that the spinning charged ring produces the measured spectral wavelengths from electrons in hydrogen molecules.[18] The ring model accurately predicts the newly discovered wavelengths found by Labov and Bowyer[19] in the extreme ultraviolet region of the spectrum—wavelengths that QT failed to predict.

Refinements: Several refinements to the ring model have been made since it was first proposed by Parson in 1915. Working independently, Iida (1974), Jennison (1979), Bergman and Wesley (1990), Bostick (1991), and Valenzuela (1997) came to similar conclusions. Bostick's last version of the ring model is a helical filament of charge wrapped around the surface of a ring—like a circular solenoid. Even though photographic evidence for the natural existence of a helical structure was obtained in Tokamak experiments using ionized gas particles, was observed in other gaseous plasmas, and was photographed in some lightning bolts, the Bostick refinement needs more theoretical work to determine the precise distribution of charge in the spinning charged ring.

Summary

A physical model of the electron has been derived from logical considerations and four conditions:

1. The electron is composed of one quantum of electrical charge.
2. The forces at the surface of the electron must be in balance.
3. The electron has a magnetic moment slightly larger than one Bohr magneton.
4. The electron has measured mass and equivalent electromagnetic energy.

These four conditions were used to determine the physical and electrical characteristics of the electron in the spinning charged ring model. Although just four conditions were used to create the ring model, it is consistent with various and sundry properties of the electron described earlier. The physical and electrical characteristics of the spinning charged ring electron are listed in Table 1.

The ring model of the electron is a physical model, in contrast to the abstract mathematical description given for the quantum electron. The ring model depends upon well-established laws of electricity and magnetism, and it is a classical electrodynamics model that follows the *law of cause and effect*. It appears to be free from internal contradictions and defects that characterize other models that have been proposed.

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Manhattan Scientifics and Aprilia Unveil New Fuel Cell-Powered CONCEPT SCOOTER at Paris Fair

PRESS RELEASE, LOS ALAMOS, N.M., April 30, 2002—Manhattan Scientifics, Inc. (MHTX), a U.S. technology development company specializing in alternative energy, and Aprilia, Europe's second largest two-wheel vehicle manufacturer, unveiled a new fuel cell-powered scooter today at the International Paris Fair.

The scooter is an environmentally friendly electric concept vehicle called "MOJITO FC." Powered by Manhattan Scientifics' new 3000 watt fuel cell, the scooter is silent, pollution-free, and ideal for urban use. Fueled by hydrogen, production models should be capable of covering 120 miles with a single fueling, at a top speed of at least 35 miles an hour.

The MOJITO FC is the second Aprilia fuel cell-powered concept vehicle developed with Manhattan Scientifics. The two companies previously developed the Aprilia ENJOY FC, a concept fuel cell powered bicycle. In 2001, the ENJOY FC bicycle received strong international press coverage and received one of *Time* Magazine's 2001 "Inventions of the Year" awards.

Manhattan Scientifics developed the vehicles with Aprilia to interest manufacturers and other parties in the advantages of fuel cell powered personal transportation. The company believes that in production, the fuel cell scooter will be highly competitive with and have many advantages over battery and gasoline powered scooters.

The new scooter uses Manhattan Scientifics' proprietary fuel cell technology developed by its German unit, NovArs GmbH. The fuel cell is a hydrogen/air system using advanced materials and unique technologies to minimize size and weight. The system operates under ambient conditions without additional ancillary equipment such as pumps or special cooling. The fuel cell system, including all electronics, valves, and fans, weighs slightly less than 6 kg. The weight of the fuel vessel is only 4.3 kg.

Manhattan Scientifics believes fuel cell scooters with optimized drive systems will achieve a higher top speed and quicker acceleration than current vehicles with 50 and 80 cc internal combustion engines. In addition, with an integrated fuel supply, the scooter should provide at least twice the range of a battery driven vehicle on a single fueling.

Manhattan Scientifics' Chief Operating Officer Jack Harrod said, "This fuel cell-powered scooter is a continuation of our efforts to introduce practical, alternative energy power for personal transportation. There are an estimated 100 million motorized two-wheel vehicles in use worldwide with the greatest number concentrated in the crowded cities of Asia. Global scooter production exceeds seventeen million units annually and use is expanding. Pollution and noise are major problems in crowded cities particularly in Asia. In year 2000, an estimated ten million noisy, polluting scooters were sold in China and three million in India. We believe our non-polluting fuel cell scooter could play an important role in helping to alleviate these conditions."

CEO Marvin Maslow said, "We believe our NovArs technology sets the benchmark as the smallest size and lightest weight engine in the budding fuel cell industry. This means our patented engine has particular application with portables—everything from laptop computers to power tools to bicycles, scooters, golf carts, wheelchairs, and small boats. Imagine driving the new MOJITO scooter in total silence for 120 miles on a single fueling of inexpensive hydrogen."

Maslow added, "Industry experts believe it might be a decade before we see true mass production and mass purchased fuel cell cars on our roads. But this need not be true for other smaller forms of fuel cell-driven personal transportation, which are expected to play a significant role in the near term for 'people moving.' This has particular significance today with our emphasis on lessening our dependence on foreign imported oil. We are entering the hydrogen age. Hydrogen is the basic source of energy in the universe. The sun is fueled by hydrogen and our oceans contain a virtually inexhaustible supply of it. Eventually hydrogen will become a readily available inexpensive fuel and we will use it to power our homes, our transportation, our offices and our factories."

Manhattan Scientifics, Inc. is a technology development company working in the fields of alternative energy and fuel cells and on commercial applications for touch technology. The company's development laboratories are located in Los Alamos and Albuquerque, New Mexico and Passau, Germany. Its executive facility is located in New York City. Copies of Manhattan Scientifics' press releases, current quotes, stock charts, and other information for investors (as well as images of the scooter) may be found on the websites www.mhtx.com and www.hawkassociates.com.

Executive Contacts: Jack Harrod, COO, Manhattan Scientifics (214)675-8033, E-mail: harrod@airmail.net; Marvin Maslow, CEO, Manhattan Scientifics (917)923-3300, E-mail: maslow@ix.netcom.com.

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Household Energy Use Guide

How much energy does it take to operate household items? The chart below will help answer that question. Electrical energy is measured and purchased by kilowatt-hours (kwh). The kwh consumption of household appliances, tools, and equipment listed below are based on the normal use for a family of four and are estimated monthly and annual averages compiled from various sources (received by *Infinite Energy* from Concord Electric Company, our local utility, in Concord, New Hampshire).

Electricity used by items such as ranges, oil burners, freezers, and refrigerators will not vary appreciably with the size of the family. Other appliances and equipment will vary considerably with the hours of operation, family lifestyle, and individual usage.

	Est. Monthly KWH	Est. Annual KWH
Appliances/Continuous Operation		
Quick Recovery Water Heater	400	4800
Added Hot Water - Dishwasher	100	1200
Added Hot Water - Clothes Washer	75	900
Added Hot Water - Tub Bath	30	360
Added Hot Water - Showers	30	360
Refrigerator - 12 Cu. Ft.	65	780
Refrigerator/Freezer - 14 Cu. Ft.	86	1032
Refrigerator/Freezer - Frostless		
14 Cu. Ft.	120	1440
17 Cu. Ft.	145	1740
19 Cu. Ft.	160	1920
21 Cu. Ft.	180	2160
Food Freezer		
Chest Type - 16 Cu. Ft.	90	1080
Upright - 16 Cu. Ft. - Manual	110	1320
Upright - 16 Cu. Ft. - Frostless	160	1920
Water Pump	20	240
Sump Pump	10	120
Seasonal Items/Winter (5 Months)		
Electric Blanket - 8 Hours/Night	25	125
Electric Snow Blower	12	60
Heater - Portable - 6 Hours/Week		
500 Watts	30	150
750 Watts	45	225
1000 Watts	60	300
1500 Watts	90	450
Heater - Auto Engine - 500w 8 Hours/Night	90	450
Heater - Auto Engine - 1000w 8 Hours/Night	180	900
Heating Cable (30 Ft. Length - 210 Watts)		
Roof Cable - 20 Hours/Week	15	75
Heat Tape - Cont. Operation 720 Watts - Water Pipes	151	755
Heating Plant - Burner Motor	60	300
Hot Air Fan	90	450
Hot Water Circulating Pump	30	150
Humidifier	40	200
Water Bed Heater		
King Size	154	770
Queen Size	116	580
Seasonal Items/Summer (5 Months)		
Air Conditioner (Window) 10,000 BTU	210	1050
Central Air Conditioning (3-Ton)	500	2500
Dehumidifier - Automatic	180	900
Electric Lawnmower	15	75
Fan - Attic	100	500
Fan - Circulating	26	130
Fan - Roll Away	51	255
Fan - Window	60	300
Swimming Pool Filter		
Above Ground (4 Months)	180	720
In Ground (4 Months)		
16'x32'	180	720
18'x36'	210	840
20'40'	360	1440
Bug Zapper (4 Months)	50	200

	Est. Monthly KWH	Est. Annual KWH
Year-Round Items		
Broiler - Roaster - 2 Hours/Week	12	144
Ceiling Fan - With Light	20	240
Ceiling Fan - Without Light	9	108
Ceramic Kiln	200	2400
Clothes Dryer - 4 Hours/Week	80	960
Clothes Washer - 4 Hours/Week	24	288
Coffee Maker	8	96
Compactor	4	48
Computer (Personal) - 10 Hours/Week	12	144
Crock Pot	10	120
Deep Fat Fryer	7	84
Dishwasher - Dry Cycle	20	240
Dishwasher - Wash Only	4	48
Fish Tank - 10 Gallons/Light and Heater	32	384
Fish Tank - 50 Gallons/Light and Heater	87	1044
Food Mixer - Hand Held	2	24
Food Mixer - Stand Type	3	36
Hair Dryer (1500 Watts)	15	180
Hair Curlers	3	36
Hot Plate	9	108
Iron - Hand	12	144
Jacuzzi		
Initial Heating of Water	30	360
Maintain Water Temperature	140	1680
Pump Filter and Jet	30	360
Lighting		
5 Rooms	75	900
7 Rooms	90	1080
10 Rooms	113	1356
Fluorescent Tubes		
2 Bulbs	24	288
4 Bulbs	48	576
Outdoor Light - 100W - 5 Hours/Night	15	180
Motor - 1 Horsepower - 2 Hours/Week	20	240
Microwave Oven	16	192
Power Tools		
Bench Grinder - 2 Hours/Week	6	72
Circular Saw - 2 Hours/Week	10	120
Drill - 2 Hours/Week	4	48
Saber Saw - 2 Hours/Week	4	48
Sander Belt - 2 Hours/Week	6	72
Soldering Gun	6	72
Radio - Stereo - 10 Hours/Week	10	120
Range - Conventional	100	1200
Range - Self-Cleaning (Each Cycle)	10	120
Range - Large Burners - Hourly, on high	24	288
Range - Small Burners - Hourly, on high	13	156
Range - Oven Only	25	300
Television - 6 Hours/Day		
Black and White - Tube	21	252
Black and White - Solid State	10	120
Color - Tube	50	600
Color - Solid State	30	360
Toaster	11	132
Toaster Oven	15	180
Vacuum Cleaner	4	48
Vacuum (Central)	8	96
Vaporizer - 2 Hours/Week	3	36
VCR	12	144
Video Game and Television	12	144
Waffle Iron	4	48

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Ways to Initiate a

NUCLEAR REACTION

in Solid Environments

Edmund Storms*

New Energy Times Archive

Abstract

A large data base now exists to support the claim for nuclear reactions, including fusion, being initiated in solid environments at modest temperatures. This phenomenon is called Chemically Assisted Nuclear Reactions (CANR) or Low Energy Nuclear Reactions (LENR) or with less accuracy, "cold fusion." Detailed information supporting the claims can be obtained from my website:

http://home.netcom.com/~storms2/index.html

as well as from any scientific data base. These claims provide the incentive for this study. In this work, methods to produce anomalous energy are studied using electrolytic loading in D_2O of various materials (the Pons-Fleischmann method). Past work has concentration on using palladium as the active material. This paper will attempt to demonstrate that the energy-producing reactions can be made to occur in materials other than palladium. A unique method is proposed to explore many of the variables associated with the phenomenon. [This paper was originally presented at the American Physical Society Meeting on March 15, 2001 in Seattle, Washington; it is reprinted with permission of the author.]

Introduction

The so-called "cold fusion" nuclear reaction has now been studied for twelve years in eight countries resulting in over 3000 papers, many peer-reviewed. An increasing number of techniques have been used to initiate the effect, as shown in Table 1. Gradually, more and more of these methods have produced anomalous results during independent duplication, as indicated in italics. Of these, the first one has been duplicated hundreds of times in dozens of independent laboratories, including in this study. Nevertheless, duplication is difficult and frequently fails. Why is this the case? The most obvious answer, other than error, is that the unique condition required to initiate the effect is not always produced. The problem then is to identify this

Table 1. Methods Claimed to Produce CANR or LENR
(Methods independently duplicated shown in italics.)

1. *Electrolysis of D_2O-based electrolyte using a Pd or Pt cathode.*
2. *Electrolysis of H_2O-based electrolyte using a Ni cathode.*
3. Electrolysis of KCl-LiCl, D electrolyte using a Pd anode.
4. *Electrolysis of various solid compounds in D_2 (proton conduction).*
5. Gas discharge (low energy) using Pd electrodes in hydrogen.
6. Gas discharge (low energy) using Pd electrodes in deuterium.
7. *Ion bombardment (high energy) of various metals by D+.*
8. Gas reaction (H_2) with Ni under special conditions.
9. Cavitation reaction involving D_2O and various metals using an acoustic field.
10. Cavitation reaction in H_2O using microbubble formation.
11. *Reaction of finely divided palladium with pressurized deuterium gas.*
12. *Plasma discharge under D_2O or H_2O.*
13. *Biological systems.*

unique condition and to find ways to create it on demand. That is the goal of this study.

We now know for CANR to occur, very special conditions must be created within a solid. These conditions must bring the hydrogen or deuterium atom next to the target nucleus and then lower the coulomb barrier to allow nuclear interaction. This process must also carry away the energy produced. A number of theories have been proposed to explain how this barrier lowering is accomplished. Unfortunately, few of these models address how to produce the required environment. Two models have suggested characteristics that can be tested. These are the Chubb model,[1] which focuses on a unique size for the active domain, and the Hora-Miley model,[2] which focuses on the interface between two materials having different Fermi energies. Testing these models has been difficult because the required conditions are hard to achieve. I would like to describe a method that I have developed to make this test and show some of the results.

Past work has shown excess power production by electrodes other than palladium.[3] In addition, examination of such electrodes after energy production reveals areas in which molten metal had been produced. In addition, a published examination by an imaging IR detector[4] while energy was generated showed many small regions of higher than ambient temperature. These observations suggest that the active regions are not in the bulk metal, but are special regions that have grown or have been deposited on the surface of the cathode. This possibility is explored here.

Method

Of the several techniques used successfully, the electrolytic method of Pons and Fleischmann[5] has achieved the greatest understanding. This method is used here with excess energy production being the criteria of success. Two types of calorimeters have been employed, a flow-type and a Seebeck type.[6] An electrolyte consisting of 0.25 g Li_2O + 50 ml D_2O is used. The electrolyte was in contact with only Pyrex, Teflon, and Pt, besides the cathode material.

Calorimetry: A picture of the flow-type calorimeter is shown in Figure 1. The jacketed cell is contained in a Dewar flask and this assembly is contained in a box held at 20 ± 0.02°C, a temperature equal to the input water temperature at the jacket. The cell is stirred at constant rate using a magnetic stirrer. When fully assembled, the Dewar is raised and the stirrer is slipped underneath. An insulated lid covers the Dewar. In this way, any energy that leaves the cell through its Teflon lid is contained in the Dewar where it can be captured by water flowing through the cell jacket. Characteristics of this apparatus are listed in Table 2. Error values noted in the table are based on the calibration equations listed in Table 3. These calibrations were made periodically during the study.

A picture of the Seebeck is shown in Figure 2. Seen in the picture are the computer and the oil reservoir that seals the cell from the atmosphere. Oil leaves or enters the reservoir in response to changes in pressure within the cell. A change in weight of oil provides a means to monitor the amount of gas within the cell and the effectiveness of the recombiner. A picture of this device as used on the flow-type calorimeter can be seen on the website noted above. The Seebeck envelope is water cooled at 20 ± 0.02°C and contained in a box held at 20 ± 0.02°C. A picture of the cell is shown in Figure 3. The upper metallic region is designed to prevent electrolytic spray from attacking the Pt-carbon-based recombiner contained therein. This picture shows a cell to which cooling tubes are attached. Most of the work, to which the listed errors and equations apply, was based on a similar cell without these tubes.

Both calorimeters were calibrated by using a clean Pt cathode or by using an internal Joule heater. Typical calibrations are shown in Figure 4. The main difference between the two calorimeters is the temperature that the cell achieves as applied current is increased, with the Seebeck cell being forced to a much higher temperature. In all cases, excess power is the difference between applied electrical power (V x A) and the resulting calculated heat.

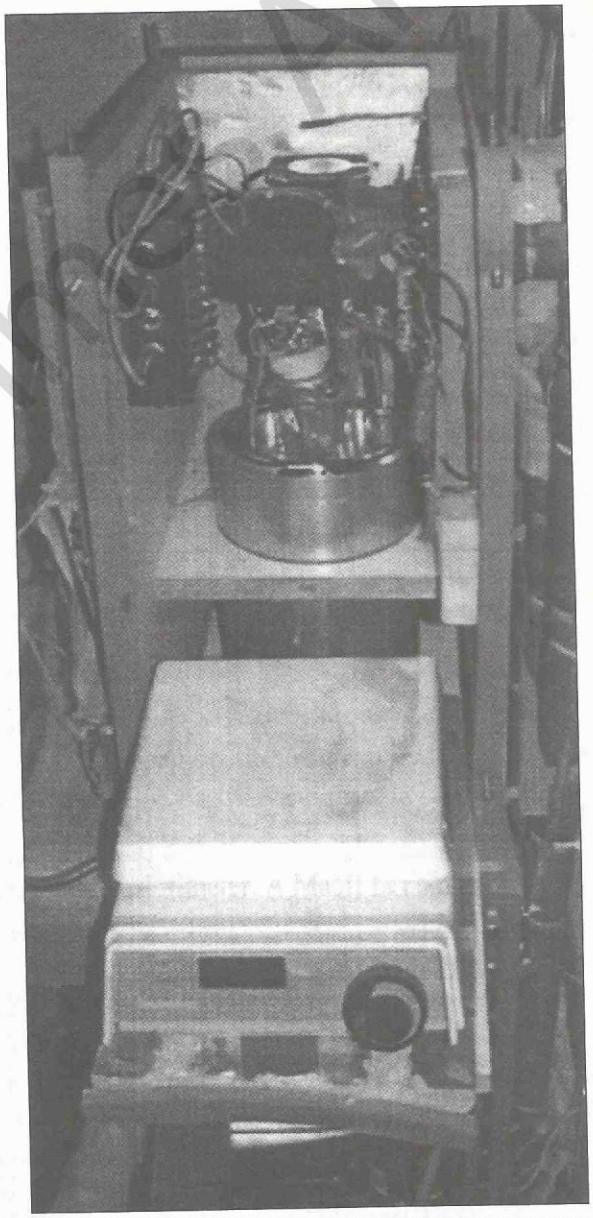

Figure 1. The open flow-type calorimeter. During operation, the Dewar is raised and the stirrer is pushed under it. Two panels close the box and provide thermal isolation.

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Table 2. Characteristics of Calorimeters

FLOW-TYPE

[Original design]

Pt-carbon-based recombiner
Sealed with oil reservoir
Pt mesh anode
Average scatter within each data set = ±0.054 W
Average uncertainty at 3 A between calibrations = ±0.08 W (0.4% at 20 watts)
Average uncertainty in flow measurement = ±0.05 g/min
Fraction of heat capture = 0.986

SEEBECK-TYPE

[Thermonetics Corp.]

Pt-carbon-based recombiner
Sealed with oil reservoir
Pt mesh anode
Average scatter within each data set = ±0.030 W
Average uncertainty at 3 A between calibrations = ±0.10 W (±0.5% at 20 watts)
Average uncertainty using heater calibration = ±0.04 W (±0.2% at 20 watts)

Sample Preparation: When a material is electroplated, any particle of foreign material floating next to the cathode can be captured by the growing layer. Consequently, any type of insoluble, inert powder can be incorporated into the deposited metal. This material can then be subjected to high hydrogen or deuterium activity when the cathode is subsequently used in a Pons-Fleischmann electrolytic cell. Aside from providing a way to study materials that cannot be fabricated into a coherent structure, suitable for a cathode, the process might also operate by chance in "normal" Pons-Fleischmann cells and be the source of active sites on the otherwise inert palladium cathode. In this case, slow deposition of Pt and Li would capture particles of PtO flaked from the anode or particles derived from the Pyrex, for example.

Samples were prepared by co-plating various powders along with palladium onto clean platinum or silver coupons (1 cm x 2 cm). The plating solution is one that is used in the jewelry trade and is based on an organic palladium compound.

Results

A variety of materials were studied with some producing excess energy, but with most being dead. Even this method is not completely reproducible, although better than many.

Table 3. Coefficients in Calibration Equations

FLOW-TYPE CALORIMETER
Coefficients in the Equation
Watt = A + B*(ΔJ*F)

	A	B	Flow Rate (F) (g/min)
	-0.0032	0.07090	29.22
	0.0033	0.07090	29.30
	-0.0150	0.07051	29.30
	-0.0140	0.07042	29.30
	0.0590	0.07079	24.30
	0.0746	0.07040	24.50
	0.0530	0.07090	24.50
AVERAGE=	**0.0225**	**0.07069**	
STANDARD DEVIATION=	**±0.0382**	**±0.00020**	

(ΔJ = temperature of water between inlet and outlet of jacket)

SEEBECK CALORIMETER
Coefficients in the Equation
Watt = A + B*(Seebeck Volt)

	A	B	Method
	0.139	178.16	E
	0.178	177.42	H
	0.134	179.81	E
	0.132	178.97	E
	0.108	179.30	H
	0.133	178.74	E
	0.138	178.78	H
AVERAGE=	**0.137**	**178.74**	
STANDARD DEVIATION=	**±0.021**	**±0.77**	

(H = internal Joule heater; E = electrolysis using clean Pt cathode)

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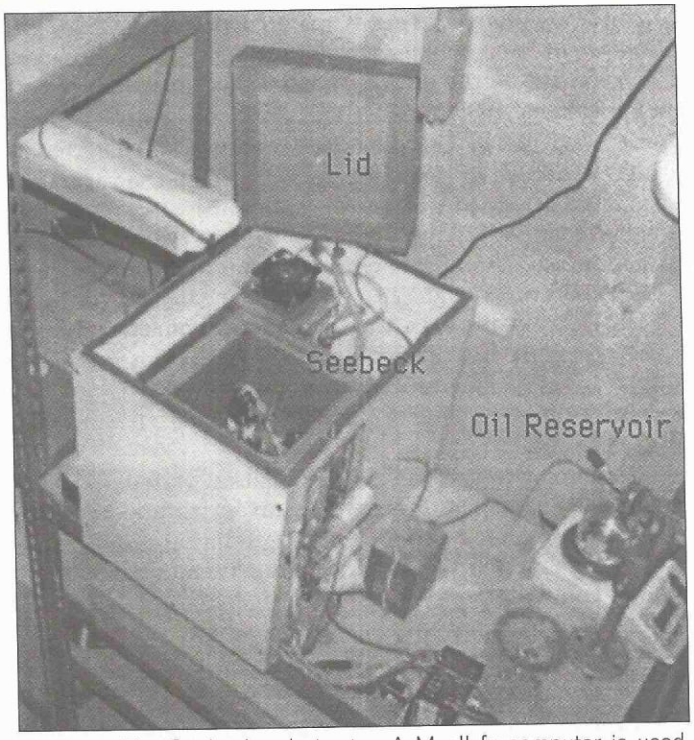

Figure 2. The Seebeck calorimeter. A MacII fx computer is used while running Labview.

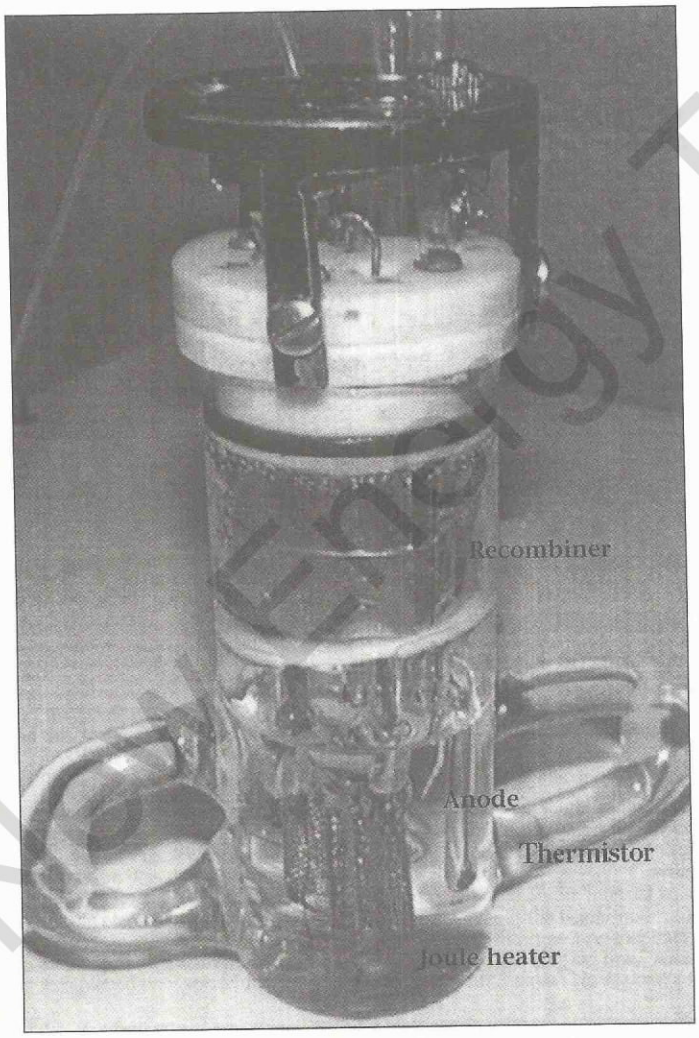

Figure 3. Seebeck cell with cooling tubes. The recombiner is protected by a wrap of Pt foil.

TiO_2 + Pd: TiO_2 (<20 µm) was mixed with the Pd solution and plating was done at 14.5 mA for 2 hr onto a standard Pt coupon, with stirring. This process caused a weight increase of 0.032 g. After being placed in the Seebeck calorimeter, current was first increased (then decreased) in steps. Data shown in Figure 5 were taken 90 min after each current change to insure thermal equilibrium. Calibration was done just before and just after the run using the electrolytic method and then the internal heater method. The plotted data are based on the internal heater calibration. Note that the electrolytic current is plotted for the sample, but the heater current is used for the calibration. Both produced about the same applied power at 3 A. The data suggest an increase in excess power as current is increased, as indicated by the sloping line. After the run, the sample was placed on Type 57 high-speed Polaroid film for eight days. No exposure was seen.

Carbon + Pd: Carbon (0.4 µm dia. x 100 µm threads) was mixed with Pd plating solution and two samples were made. The first was a Pt coupon plated at 0.1 A for 10 min with stirring, but not heated. This treatment produced a weight gain of 0.00536 g. The second Pt coupon was plated at 0.1 A for 18 min while being stirred and heated to over 50°C. A weight gain of 0.0262 g was measured. The first sample was placed in the flow-type calorimeter and studied by the usual step method with a delay of 60 min after the current change before data were taken. This sample was removed and replaced by the second sample, which was studied in the same manner. After this run, the sample was removed and replaced by a clean Pt cathode, and calibration was done in the same manner. Next, the second sample was returned to the flow-type calorimeter and rerun. All of the measurements are plotted in Figure 6. Apparently, similar excess power was produced by the two samples and it increased with applied current.

Sterling Silver + CO_2: A coupon of Sterling silver was electrolyzed at 7-20 mA for 24 hr as the cathode in a cell containing a saturated solution of CO_2 in distilled water. A weight gain of 0.00049 g was measured and the sample was observed to have acquired a yellow-gray coating. This sample was placed in the flow-type calorimeter and run in the usual manner, followed by calibration. The result is shown in Figure 7. Higher apparent excess power was seen as the current was decreased compared to when it was increased during the initial steps. In addition, holding current at 2 A caused a steady decrease in excess power, as shown in Figure 8. Allowing the sample to remain in the electrolyte without applied current caused a loss of silver from the surface and a complete loss of excess power. Following this run, the previously clean Pt calibration cathode was found to have acquired a surface coating of Ag and to have produced apparent excess power, although not as much as the Ag sample.

CeO_2 + Pd: Powdered CeO_2 (0.8 µm) was mixed with the plating solution and two samples were made. The first (C#6) was made by plating on a Pt coupon at 50 mA for 6 min, with stirring and heating. A weight gain of 0.00625 g was produced. The second sample (F#1) was plated at 20 mA for 109 min, with stirring and heating, and showed a weight gain of 0.04208 g. Both samples were studied in the Seebeck calorimeter with the result plotted in Figure 9. Next, sample F#1 was transferred to the flow-type calorimeter and studied in the usual manner. As can be seen in Figure 9, sample F#1 produced similar, although

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small, amounts of excess energy in both calorimeters. In addition, the effect of applied current was similar, even to the extent that the same currents produced the same behavior. Note the abrupt rise above 2.0 A and the drop at 3.0 A in both cases, in spite of different temperatures being applied and use of entirely different data acquisition systems. Sample C#6 was essentially dead in the Seebeck calorimeter.

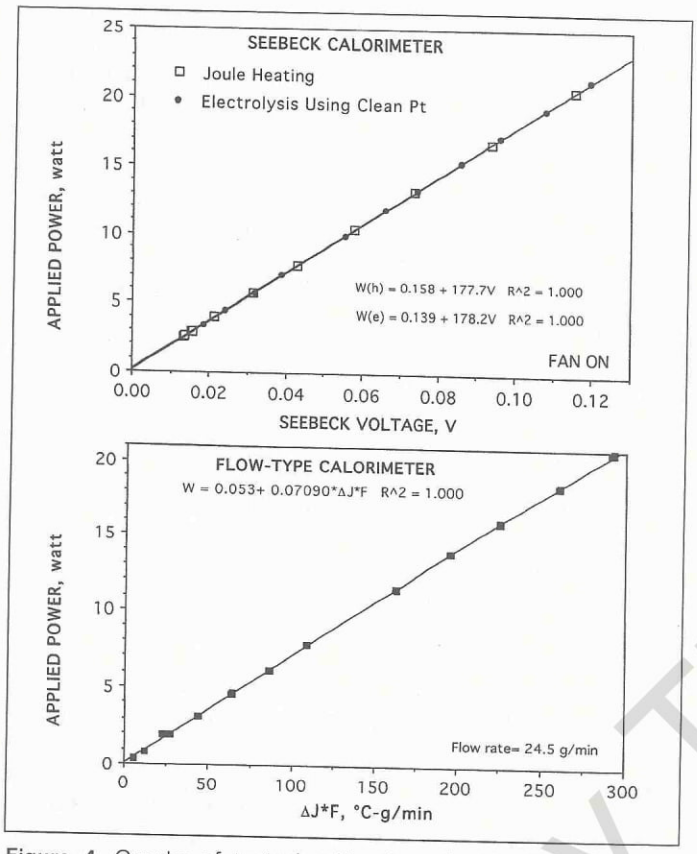

Figure 4. Graphs of typical calibrations for the flow-type and Seebeck calorimeters.

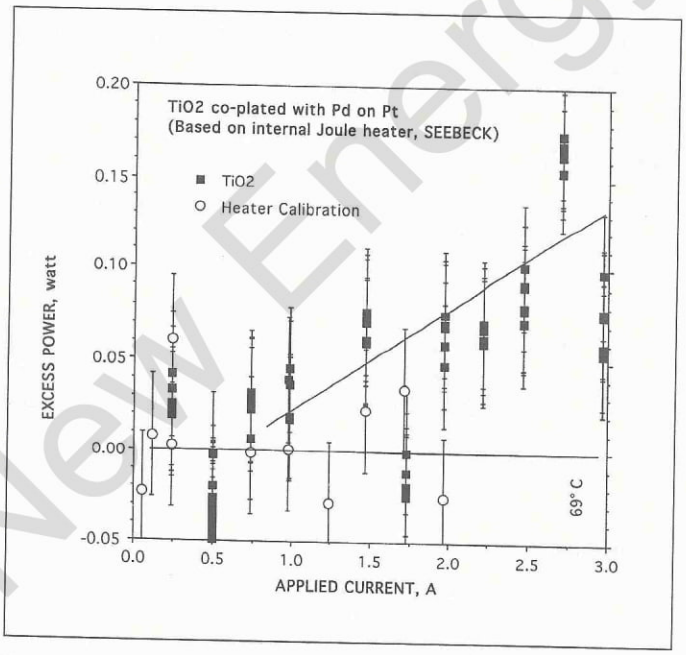

Figure 5. Effect of applied current on excess power production using a cathode made from TiO_2 co-deposited with Pd.

Discussion

Skeptics have previously concluded that any claim for excess power under these conditions must be caused by ignored errors in calorimetry. This study has used two different types of calorimeter and found excess power that lies outside of a careful evaluation of random errors in both instruments. In addition, samples made using the same technique were found, on

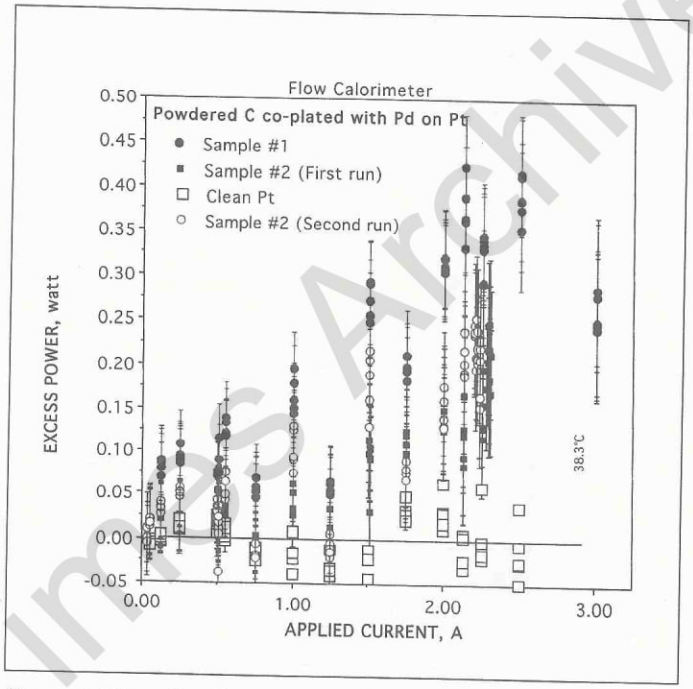

Figure 6. Effect of applied current on excess power production using a cathode made by co-plating carbon with palladium.

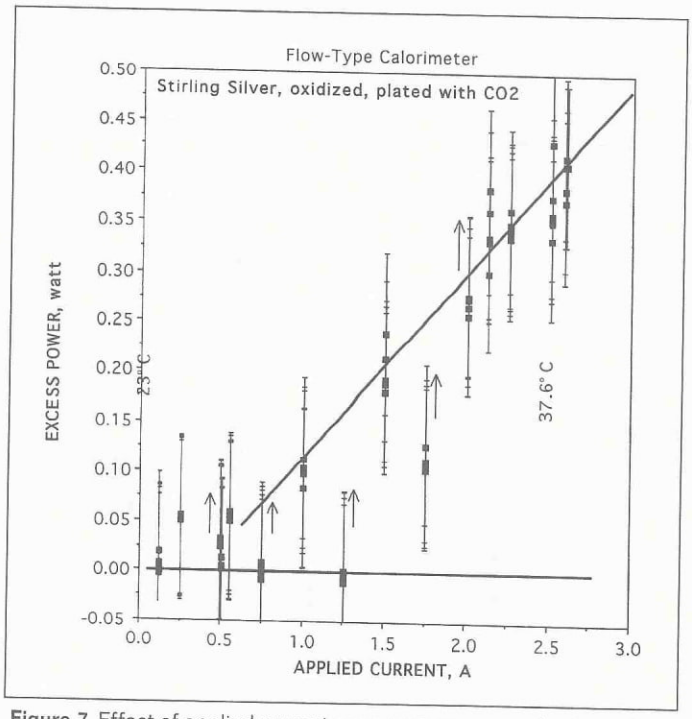

Figure 7. Effect of applied current on excess power production using a cathode made by depositing carbon from CO_2+H_2O solution onto sterling silver. Points going up in current are indicated, starting at 0.5 A. When current reached the highest current, it was reduced in steps until 0.25 A was reached.

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occasion, to give similar values for excess energy. While the results might be caused by random error, the pattern of behavior is consistent with previous reported studies and with the assumption that the nature of the material is the main variable affecting apparent excess energy production. Once error is no longer a viable explanation, a problem remains to understand what about the sample causes the effect. This study cannot fully answer the question at this time. It can only show that by co-plating finely divided materials of various kinds, excess energy can be produced more frequently than was previously possible. An interpretation of the behavior must await use of proper diagnostic tools to see just how the small grains of material are situated within the palladium layer. For example, one might speculate that the grains of oxide, being completely surrounded by palladium, are prevented from losing oxygen as they would on the surface. Consequently, they can be exposed to a higher deuterium activity without being changed, thereby producing unexpected behavior. Grains of carbon, on the other hand, can have a physical form that is not possible under equilibrium conditions within bulk palladium metal. In addition, such grains can not be made into a coherent structure suitable for use as a cathode, hence this method is the only one available for their study. After being incorporated within Pd, the carbon grains could then absorb deuterium at very high activity from the surrounding Pd and obtain a composition not possible under any other condition. Introduction of various powdered metals would allow the model of Hora-Miley to be tested without layer separation normally experienced during past attempts. The Chubb model could be easily tested by incorporating particles of different sizes, something that is not possible to do in normal bulk palladium. While this study focused on palladium, the method can also use any metal that can be plated from solution. The number of available possibilities is much greater than the resources presently available to the author for their exploration. An additional advantage of the method is production of excess energy without delay, in contrast to the usual experience when the Pons-Fleischmann method is used.

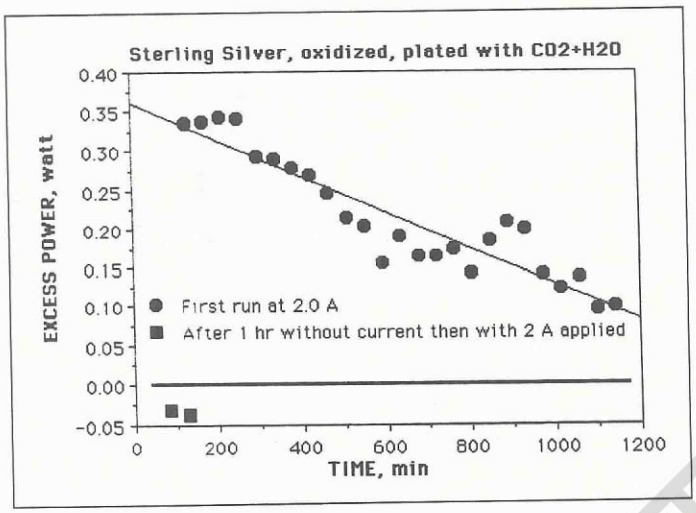

Figure 8. Effect of time at 2 A on excess power production using the Ag+C cathode.

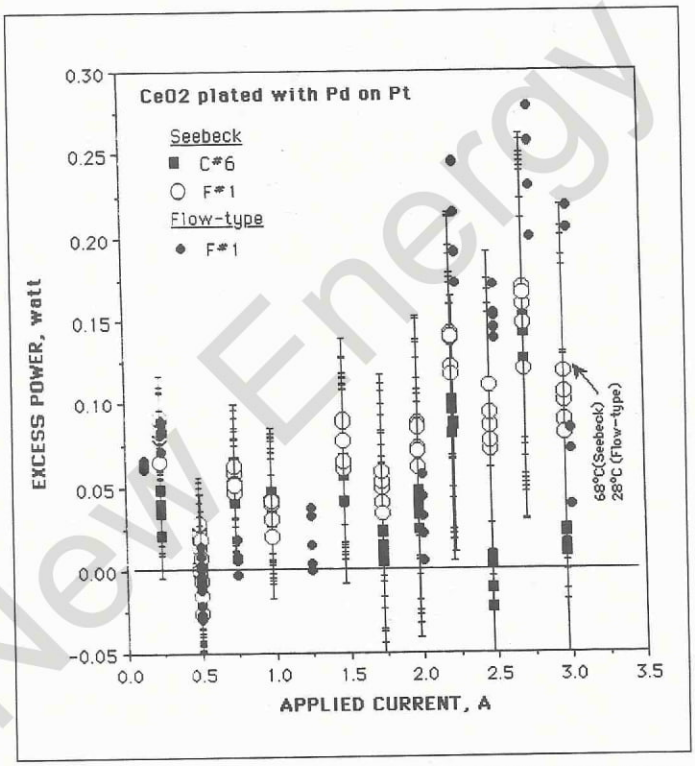

Figure 9. Effect of applied current on excess power production using a cathode made by co-plating CeO_2 and Pd on Pt. Also shown is a comparison between excess power production using the same sample in the flow-type and the Seebeck calorimeters.

Production of excess power from Pd in contact with various oxides is unexpected. Such materials are good insulators without an occupied Fermi band and do not take up much hydrogen within their structure. It would seem that they qualify as suitable materials for neither the Chubb nor the Hora-Miley models.

This study is unique in using two different types of calorimeter to test the same sample. Although the amount of excess energy is small, it is outside of expected random error. More interesting is the observation that excess power, in both cases, shows the same complex relationship to applied current. Eagleton and Bush[7] found a similar fine-structure when studying cells containing H_2O with a Ni cathode. Swartz[8] also reported a similar fine-structure he attributes to an optimum operating point (OOP), although in this case the fine structure was seen in the applied power versus excess power fraction relationship.

Conclusion

1) Co-plating with various finely divided suspensions makes possible a unique exploration of many variables associated with the Pons-Fleischmann effect and with a reproducibility greater than has been obtained in the past.

2) This study has produced anomalous power on several occasions using different calorimeters and materials. The amount of material being used is too small to offer a conventional chemical explanation.

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About the Author

Edmund Storms, Ph.D. in radiochemistry, is retired from Los Alamos National Laboratory. He presently lives in Santa Fe, where he is investigating the "cold fusion" effect in his own laboratory. A complete biography can be found in *IE* No. 32.

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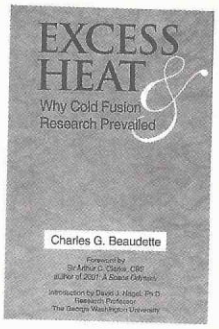

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DARK MATTER RULES

Carl Hollingsworth and Henry Hallmon*

Editor's Note: We almost rejected this far-ranging, imaginative essay, but had second thoughts. It is a stimulating "thought-poem" that has a certain "ring of truth" about it, even though we doubt that it is accurate "physics." But, just a thought (so to speak), it just might be good "philosophy." You decide! — EFM

Introduction

"Dark Matter Rules" is a position paper generated from basic research on fluid-form interactions. Mathematical formulae are omitted and scientific background simplified in the interest of comprehension. Our Naked Singularity Model is surprising in its implications. We have arrived at our present position through analysis and subsequent revision. While both excited and comfortable with the proposed model, it is still speculative in many elements and open to revision.

Dark Matter

A profound puzzle has emerged from recent scientific discovery. Dark matter appears to be a common feature—so common that the majority of mass is dark. Dark matter is predicted in the disc of our galaxy and in envelopes around every galaxy. The mystery is: what is it and why can't we find it?

The solution may be right under our noses. A naked singularity model solves dark matter's mystery with the same rules for a single cell as for a single galaxy. For dark matter the rules of physics, as we know them, do not apply. It exists as informational mass in negative space. This solution to dark matter's mystery dramatically changes our understanding of quantum physics and information's physical nature.

A word of warning to the reader: this story ventures far afield of currently accepted thinking. Before proceeding you may want to consider this medieval Icelandic poem:

Words of High Ones

(author unknown)

"Who travels widely needs their wits about them.
The stupid should stay home."

The Naked Singularity Model

We are looking at a new model of physical organization, a parallel network of conserved information.

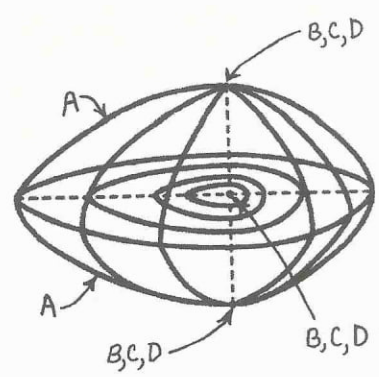
Our naked singularity model identifies two components to physical structure. The two components are separated by individual requirements of existence, yet inseparably linked in every host environment. Unextended component one exists adjacent to extended component two. The two do not interact directly. Instead interactions occur in frequency space by some sort of phase-coupling phenomenon. Nerve impulse traffic generates the necessary frequency waves for phase-coupling. We have determined the transport energy source as boundary layer motion. The boundary layer behavior absorbs all surrounding frequency waves. It then transports the eigenfrequency to naked singularity locations at greatest chord height or depth, where it stops. At this point the delivered eigenfrequency can phase-couple since it is time-locked and polarity matched. We will explore this transport mechanism in depth later.

Some Predicted Elements

- A naked singularity has slight mass.
- A naked singularity is negative space.
- A naked singularity requires a strongly asymmetric environment.
- Functional asymmetric enclosure is provided by all host forms.
- Such enclosure must approach maximum surface for volume enclosed.
- A naked singularity is time-locked.
- Shifts of a naked singularity from one host enclosure to another are worm-hole events.
- Worm-hole events are time-locked. Naked singularities are interconnected by a time-locked history of host location and worm-hole events.

These predicted elements paint a strange picture of an adjacent negative space beyond the grasp of our senses.

Figure 1. The Model



A: Asymmetric Enclosure
B: Negative Space Location
C: Naked Singularity
D: Time-Locked

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Similar notions have always captivated human thought. A brief history lesson will help you get the idea.

The Unextended World

The story of the unextended world is an ancient one, with roots stretching back to prehistory. Hermetic science described the unextended as prime material.

"Prima Materia" served as a ghostly template behind the visible shapes of matter. Everything, from mineral to man, contained this very fine and subtle spirit substance. The visible was considered a mirror image of prime material and had no independent existence of its own.

This mind in the body idea pretty much prevailed until the beginnings of Western science and René Descartes' birth in 1596. Only since Descartes is the material world broken in two. Matter, the stuff you can see and touch, claims the property of spatial extension. Mind is separate and lacks spatial extension. Interchangeable mind, soul, or spirit literally exist in an unextended state without occupying space. Today this is considered dualist philosophy (the view that both mind and matter are real but separate).

René Descartes is credited with the unextended idea. He considered mind and soul the same thing—a spiritual entity unextended in space. The body has extension, while mind does not. Mind's nature is to think, therefore exist. Because mind is independent of the body it survives body death. Descartes famous quote, "I think therefore I am," first appears in the 1637 *Discourse on the Method* in French.

By 1637 Galileo was under house arrest. A risky time for new and possibly heretical ideas. In 1644 the idea appeared in Latin (*cogito ergo suma*) as the lead to *Principles of Philosophy*. Here he separated the thinking thing (*res cognitans*) from that which has extension (*res extensa*).

Not just a philosopher, Descartes was mathematically sophisticated. He developed Cartesian Coordinate graphs. Calling the square root of negative numbers imaginary (a term still in use), he chose not to extend his graphs to the negative—an oversight almost immediately remedied by his contemporaries. (See Figure 2.)

Cartesian graphs have developed into one of the best scientific tools. While a mathematical formula is sufficient for precise description, a glance at corresponding graphs clearly shows how change in one quantity influences others. Today these graphs are widely used in science and industry to graphically represent directional or measured quantities, and formulae. For this Descartes is generally considered the founder of analytical geometry, or at least the first to write about it.

While embracing analytical geometry, science regards Cartesian dualism with horror. How is it that a mind or soul is unextended in space? Where is it? How can it interact with the extended physical host? Such a transaction seems impossible. Surely mind can be a property of the material body without resorting to an imaginary unextended world.

Descartes could never adequately respond to these and other criticisms. He tried, but the needed technology just wasn't there. Today the tables may have turned. From the archaic viewpoint, astonishing advances in neuroscience, genetics, and quantum physics have already answered the where and how of the unextended world. But we're getting ahead of the story. Let's start at the beginning—the Hermetic science of prime material.

Hermetic Science

In the centers of form
The prime material hides
Informing the host
That it secretly guides

For thousands of years one idea—Hermetic prime material geometry—stood as the foundation of science. A concept that survived civilizations lives on in the popular imagination, yet is rarely presented in its original scientific context. Strange indeed that an idea once widely understood has become difficult to rediscover.

Let's start the inquiry with the oldest known scientific principle—"The First Prime of Universal Order," a point which is the apices of two right angles measuring height, depth and breadth (Figure 3).

The First Prime explains, with stick figure simplicity, the relationship of prime material to the host form it occupies. Prime location is strictly limited to the apices point. Height, breadth, and depth can be graphed on the shared center right angles. Descartes, a student of archaic science, may have based his Cartesian graphs on First Prime graphical representation.

In a letter to Mersenne, Descartes described the equiangular spiral as the secret to the universe. Hermetic geometry employed spirals ranging from equable to equiangular, sometimes in two-dimensional shared center spiral planes. Two-dimensional spiral planes were considered the connecting link between three-dimensional host form and one-dimensional prime material. On a First Prime graph it looks like Figure 4.

Figure 2

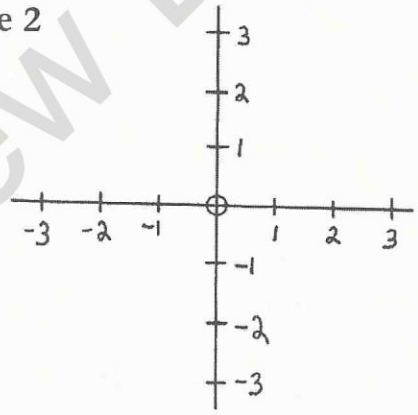

Figure 3

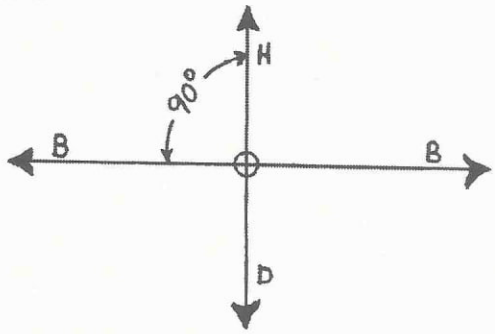

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Figure 4

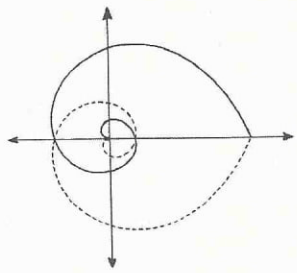
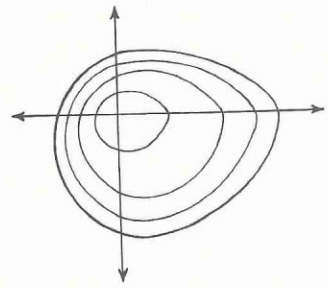


Figure 5



These two–dimensional spiral planes (when viewed from the appropriate cross section) occur throughout the natural world, but are rarely observed in the Euclidean representations. Most examples occur as conformal distortions.

Hermetic geometry artifacts display a working understanding of conformal distortions—a fairly recent achievement of modern science with Reimannian and Lobachevskian geometry. Figure 5 shows a conformal distortion of Figure 4.

Hermetic scientists concluded prime material was a subtle spirit substance hiding within the myriad forms of the universe, by occupying a strictly ordered geometry of locations. Great importance was placed on the golden ratio and Fibonacci series, both evident in the golden rectangle.

The golden rectangle is a gnomon which regressed to a potential prime location in a gnomic regression. Gnomon was defined as "any figure which suffered no change save for magnitude." Many figures fit the gnomon definition and golden ratio.

Since everything physical generates from central prime material in a gnomic growth pattern, the material world was considered a network of gnomons without independent existence of their own. (See Figures 6 and 7.)

Fascinating, but often cumbersome, technology developed along this line of reasoning, probably peaking by the late Bronze Age. Unfortunately, subsequent civilizations apparently lost the whole understanding, retaining only the sacred geometry symbolism and various mystical practices. By the time of modern scientific development, Hermetic geometry had fallen into disrepute save as fable and superstition.

It's not surprising that prime material awaits rediscovery, and it is clear the solutions of the past will not answer the questions of the future. The where, what, and how of an adjacent negative space is an extremely difficult research problem. Only in the last thirty years has science acquired the necessary expertise and technology to investigate the phenomenon. Neuroscience, for one, has developed the tools and done the research confirming a naked singularity network is possible and even probable. So, next thing, let's plug the problem into recent neuroscience observations and see what comes out.

The Neuroscience Connection

Hermetic science was self-limiting. A comprehensive understanding of the physical world lay beyond its scope of inquiry. Descartes' dualist approach took a step toward updating the prime material view, but the effort was well ahead of his time. Today rapid advances in neuroscience suggest a naked singularity model is on the right track. Let's look at some of what is presently known about neuroanatomy.

The central nervous system is constructed of two kinds of cells—neuron and glial. Glial cells support neuron cells. Neuron cells linked together in circuit generate nerve impulse traffic.

Neuron cells have three main components: 1) A cell body containing the nucleus, 2) a main output fiber known as the axon, and 3) input fibers known as dendrites (see Figure 8).

Neuron cells interconnect in synapses which usually consist of an output axon contacting the input dendrites of another neuron cell. Billions of neuron cells organize into local circuits in this manner. When arranged in parallel layers, local circuit groups are called cortical regions. When non-layered, local circuit groups are called nuclei. These microscopic local circuits group together forming pathways visible to the eye. Other non-central nervous system cell groups can selectively join circuit pathways through bundles of axons reaching to every point in the body. The whole deal forms a sort of nerve impulse traffic highway system.

Here is a thumbnail sketch of the nerve impulse. Neuron cells fire a unique electrical current from the cell body down the axon. Each neuron cell tends to talk to a few others close by. Whether or not the next adjacent neuron cell will fire depends on current strength. The basic architecture stays local. Almost any specific brain function can be traced to the group of neuron cells associated with it.

There is nothing haphazard about this mapping. Magnetic

Figure 6

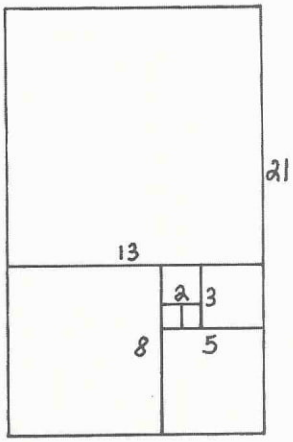


Figure 7

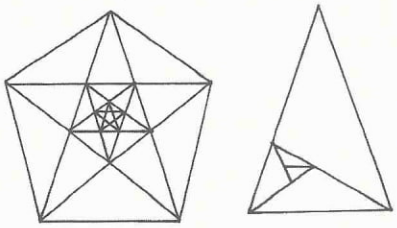


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Figure 8

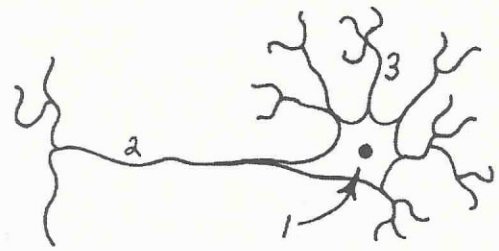
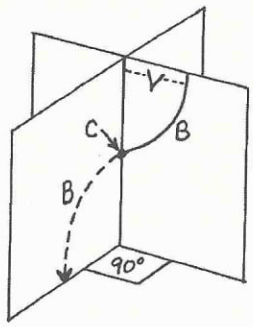


Figure 9



B: Boundary Motion
V: Velocity Fluctuation
C: Chord Height

resonance imaging (MRI) and positron emission tomography (PET) allow three-dimensional reconstruction of nerve impulse traffic. During surgery, changes in electrical potential are measured directly on the brain's surface. Polygraphs measure the skin's electrical conductance to identify specific responses. Surgeons are implanting tiny electrodes deep in patients brains. They internally connect to a battery and pulse generator that is surgically implanted below the collarbone. This powerpack delivers pulses of electricity to interrupt selected nerve impulse traffic for the purpose of controlling severe movement disorders. These, and other related results, paint a comprehensive picture of the nerve impulse traffic.

Despite impressive technical achievements, memory remains a mystery. Neural patterns function as selective storage and retrieval circuits for memory images. These are representations prompted by an object or previous experience. Location of memory images is not presently accounted for in neuroanatomy. It is known they do not bind in the circuit! The majority position is that neuroanatomy will be capable of accounting for memory image location in some yet to be discovered way.

This problem is generally known as the "binding problem." Binding requires some sort of time-locking to account for memory image storage and retrieval. This is where the historical model fits in. Prime material, in an unextended network of central nervous system locations, uniquely and elegantly solves the binding problem. In modern science terminology we are talking about negative space informational mass in a naked singularity network.

A naked singularity is different from its "center of a black hole" cousin. A naked singularity, by definition, is time-locked, and has slight mass. Our proposed idea is that naked singularity locations form a time-locked network of memory images. Well-defined neural patterns selectively store and retrieve memory images in a reversible computation process.

Presumably there is a hierarchy of this reversible computation going on. A single host cell would contain a simple naked singularity network. Memory at this level would deal with local concerns of specialized cell function. This time-locked information is available to other networks as required. At the most complicated level, consciousness is closely linked with the central nervous system. Recent evidence suggests the location of core consciousness as the midline area of the central nervous system—specifically, a right and left hand mirror image across the centerline.

Damage to these sites disrupts core consciousness while extensive damage that leaves the centerline intact does not. Not surprisingly, this centerline is ancient from an evolutionary perspective—is present in many non-human species—and matures early in embryonic growth. Many other neuroscience examples support this idea. None prove it conclusively, but the naked singularity model does solve the binding problem and otherwise holds together rather well.

The binding problem is the same for genetics. Let's consider how our model fits there.

The Genetic Code

Last year, in a rare show of unity, private sector and government funded researchers jointly declared the Genome Project substantially complete. A linear sequence base has been acquired for the fruit fly, mouse, and human. It turns out that the fruit fly has 50% of the human genetic code. Don't think this makes the fly half as complex as a person. Each human gene can make three or four different protein patterns, plus variations. A fruit fly gene is limited to one protein configuration and few variations.

The whole linear sequence, 100,000 to 120,000 genes, is in every cell in your body. Out of these about 30,000 are human genes. They are scattered here and there in the sequence. Nobody has actually seen a gene. Genetic information first appears as DNA. The DNA tells RNA what proteins to build. RNA assembles protein patterns from amino acids. Three types of RNA build protein patterns from twenty different amino acids.

Each protein folds into its own unique shape. They look like fantastic two-dimensional origami art. The next big genetics project is mapping the possible protein shapes. This counterpart to the Genome will be called the Proteo. Success seems likely since the chemical machinery of protein synthesis is so well understood. Check out an up-to-date science text for the details.

Think of DNA as the architect, RNA as the workers, amino acids as lumber, and protein patterns as the framing superstructure. Take note that the one-dimensional gene is missing from the chemical explanation. Genetic information first appears as DNA, but that is not where it is stored. It's the same binding problem as for memory. Binding requires time-locking to account for information storage and retrieval. Genetic information binds with the one-dimensional gene. It is supplied to the chemical process in a computer code. This code is written in three letter words. The

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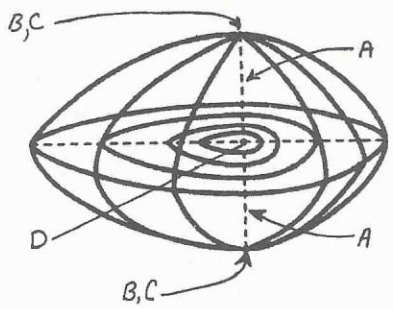
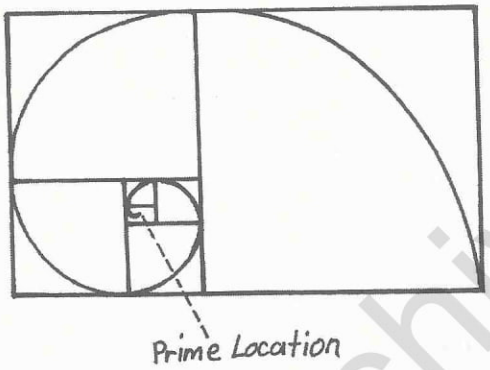
Figure 10



A: Polarity
B: Phase-Couple Point
C: Chord Height
D: Informational Mass

Figure 11



(Note: "See On Growth and Form" by Darcy Thompson on conformal equivalents.)

alphabet for DNA is A,C,G, and T. Each letter corresponds to bases adenine, cytosine, guanine, and thymine. RNA is the same except U (uracil) replaces T (thymine). Like familiar binary computer code there are no spaces between commands. For example, AUGCGG is an RNA code because it contains the letter U. This message is two command words, each the mandatory three letters long. This is the language between genes and their DNA-RNA replicating machinery.

You can see where we are going with this. One-dimensional genes represent the naked singularity network for carbon-based life. Cell wall and nucleus membranes fulfill the asymmetric enclosure requirement. But we're getting ahead of the story again. Let's see why Quantum Physics needs adjacent negative space.

The Problem with Physics

Physics is regarded as the measuring rod of reality, but there are a few problems. Astrophysics knows dark matter exists, yet has no clue what it is. Same goes for dark energy. The inquiry is concentrated on black holes and dark envelopes around galaxies. It is assumed the dark matter is out there, because no one has detected any locally.

Quantum physics' problem is at the subatomic level. Everything adds up nicely, but nobody believes that the results apply to the real world. Particles appear out of nothing, then disappear again. They exist in many places at once while behaving like both waves and particles. These and other quantum mechanics results are not in doubt. In the 101 years since Max Planck came up with the idea, it has proven the most accurate scientific theory ever developed. The catch is it only applies to the subatomic world.

You can see the problem. Modern physics has given up on measuring reality. Gravity works, so there is a bunch of dark matter at the big scale. Quantum mechanics works, but only at the small scale. This leaves Newton's mechanics, modified by Einstein. This works without including modern results.

Adding to the confusion is the MWI—many worlds interpretation of quantum weirdness. The conservative version goes like this. When a quantum measurement is made, the universe splits into two or more possible futures. The extra futures are considered abstract mathematical constructs with the real future being the one we are in. This is consistent with quantum mechanics if you stay at the subatomic level. The radical view thinks all the parallel futures are literally real. Adherents feel this brings quantum observations into the familiar world. The conservative camp figures the literal interpretation isn't worth the metaphysical baggage.

Quantum paradox is a popular theme these days. A good bookstore has several shelves on the subject. Parallel worlds and black holes are favorite topics and if you check carefully, a naked singularity is occasionally mentioned. We're not physicists, but our naked singularity model appears to solve quantum paradox better than the others. It is at least in conceptual agreement with quantum and astrophysics observations while applying one model to all scales. As the old saying goes, "time will tell."

That's about enough history and science background to get the idea. Let's see what we can say about the naked singularity model now.

Our Naked Singularity Model

Rene Descartes broke the world in two by separating mind from that which has extension. It turns out he was right. Our model suggests unextended informational mass at time-locked locations with boundary behavior as its messenger mechanism. Let's look at boundary behavior on a flow diagram. Note that it depicts an idealized laminar flow and boundary layer motion. A natural fluid-form interaction is rarely this perfect. (See Figure 9.)

Laminar flow develops the most organized boundary motion, but all flows, on a surface, generate some boundary behavior. When laminar flow occurs adjacent to a strongly asymmetric surface, the boundary motion moves at right angles to the parent flow and always in the direction of greatest chord height on the surface. This boundary behavior absorbs amplitude-frequency from surrounding frequency waves. In this manner, available informational waves bind in the boundary flow as amplified velocity fluctuations. We call the sum of absorbed informational frequency the eigenfrequency. Boundary motion carries the eigenfrequency to surface point at greatest chord height, where it stops. At this point the delivered eigenfrequency can phase-couple since it is temporarily time-locked and polarity matched with a naked singularity location. Information in the eigen-

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frequency is now informational mass at rest potential in negative space. This is the information messenger mechanism.

The simplest physical structure has these fluid-form interaction features. The most complex has the same features regardless of the complicated detail. Laminar flow rarely stays stable for long. Velocity and pressures will vary. The associated surface can deform or change aspect to velocity. Often the main contributor to laminar breakdown is the amplified messenger eigenfrequency. The more and stronger frequency waves absorbed, the quicker boundary layer velocity fluctuations trip the laminar flow to turbulent flow. We can say laminar fluid-form interactions are nature's method for storage and retrieval of informational mass.

Let's break it down into elements:

- Informational waves absorbed into boundary layer
- Boundary carried as velocity fluctuations to naked singularity location
- Stops briefly allowing time-locked polarity matching
- Transitions to negative space as informational mass at rest potential state
- Reversed process for informational mass retrieval
- Boundary breaks up releasing discrete informational frequencies into flow medium

We can go on with this, but it is just tweaking the same process into different situations. Let's review how our story points fit the model.

Hermetic

With modern tools in hand it is easy to disregard the old hermetic scientists, but they were right about the gnomic geometry. Natural morphology does reduce to 2-D spiral based planes and associated enclosures. They knew exactly where their prime material was located. (See Figure 11.)

Neuroscience

Neuroscience has tracked nerve impulse traffic to specific and localized function. They define time-locked binding as memory images stored then retrieved intact years or decades later. This is a crucial element in our model's predictions. Neuroscience is right in that nerve impulse traffic stores short-term memory in frequency space. Our model agrees that information is in frequency waves until delivered by a boundary carrier. It is informational mass only at rest potential state.

Genetics

The binding problem is the same here. Genetics research has unraveled the genetic code. Genes are one-dimensional and scattered in less than 2% of the DNA string. DNA and RNA use a chemical alphabet to spell out natural form. Our model suggests the gene is naked singularity core memory until retrieved in the DNA-RNA protein cycle. It is not clear that boundary carrier elements play a direct role in storage and retrieval of genetic information. We think a specialized mechanism is at play in the double helix environment.

Physics

We have decades old calculations in front of us as we write this. Richard Wayte, of the Imperial College of London, describes gravity in terms of mass loss transfer. This idea uniquely fits our model and has dramatic implications. It was refused consideration for lack of a suitable messenger particle function to consummate the transfer. High-energy physics needs to lose the preconceived notion of messenger particle function and broaden its approach to delivery mechanisms.

Astrophysics is doing better. They have found dark matter's footprint with sophisticated gravity lensing. The same results predict envelope enclosure surrounding galaxies. Our model requires just such a strong asymmetric enclosure. A galaxy worth of conserved informational mass will help balance the missing mass ledger.

Worm-Hole Events

This covers our model pretty well except for transitions from one host location to another and the history of transitions. We wouldn't mind skipping worm-hole events and their sum of histories. The metaphysical baggage is a load. It is, however, a clearly predicted element of our model. Let's pass on the Hollywood worm-hole illustration and stick to the elements. The transition elements are:

- Shifts of informational mass from one host location to another are worm-hole events.
- Worm-hole events are time-locked.
- Naked singularities are interconnected by a time-locked history of worm-hole events.

Our model predicts a time-locked sum of histories interconnecting everything forever. This conclusion assumes informational mass at rest potential as the transitional state. Our research indicates this is probably true. It further assumes 100% success rate for worm-hole events. This seems less likely. A conserved sum of histories is a definite maybe.

Our basic research is substantially complete. C.E.K. Mees (former director of Eastman Kodak Laboratories) defined basic research as, "The examination of materials and phenomena to discover fundamental properties, relationships and trends." Mees went on to define applied research as, "Basic research combined with existing technology to yield new technology."

We are moving on to applied research and urge the reader to do the same. It has become evident that numerous applied research applications will be productive. The trick is to take what you know, insert the appropriate model elements, and see what clicks.

About the Authors

Henry Hallmon is a graphic artist, poet, and songwriter with a passion for metaphysics and philosophy. Henry operates Gaspin Air Graphics in DeLand, Florida, where he and his wife Gail have resided since 1975.

Carl Hollingsworth is a fabricator in the aircraft and marine industry. His interest in fluid mechanics and natural morphology reflect in his work.

Carl and Henry collaborated on "Dark Matter Rules" between January and November 2001.

* Gaspin Air Graphics, P.O. Box 605, DeLand, FL 32721-0605
Phone: 386-985-5695; E-mail: hhallmon@aol.com

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Hollow Conductors vs. Zero-Point Energy

Durwood L. Creed*

In the study of electrostatics, one of the topics commonly examined is the behavior of a hollow charged conductor. Both from theory and practice this behavior has a rather surprising characteristic. This is the fact that any electrical charge introduced to the conductor will be confined entirely to the outer surface of the conductor. Thus, if a charge is brought in contact with the interior surface of the hollow conductor, the charge will immediately move to the outer surface, always leaving the interior surface electrically neutral. This special characteristic is used in the Van De Graff generator, where a stream of low potential charges introduced internally on a hollow conducting sphere results in a very high potential charge on the sphere's outer surface. The obvious success of this device prompts the asking of a very interesting question.

When a hollow conducting sphere is charged to a given level of charge or voltage, is the same amount of work required for charging it directly on its outer surface as compared to charging it indirectly on its inner surface?

Let this charging be done in a series of equal charge increments, with the same increments and total charge transfer being used for both charging techniques. If the sphere is charged directly on its outer surface, each increment of charge will require more work than the previous increment since it will require a higher voltage to overcome the accumulating voltage on the sphere's outer surface. The total work required will be the same as if the total charge were delivered to the sphere in one cycle and will also be the same as the output work available when the sphere is discharged. If the sphere is charged indirectly on its inner surface, each increment of charge should require the same amount of work as the first increment because the sphere's inner surface is shielded from the accumulating charge and rising voltage on the outer surface. If this is true, the total work required for the inner surface charging should be significantly less than the outer surface charging. However, since the accumulated charge will be the same, the output work will be greater than the input work.

Obviously, either the above conclusion is in error, because of an incorrect interpretation of the physics involved, or a new source of energy must be identified. Assuming for the sake of further discussion that the latter is true, could the zero-point quantum energy of free space be a candidate for this energy source?

It has been speculated by Robert Forward (see, *Indistinguishable from Magic*, p. 295) that the Casimir effect demonstrates that two very closely spaced conducting plates will produce a partial shielding from the external zero-point quantum energy of free space. Is it therefore not possible that a more complete spherical shielding could produce a much stronger effect?

It should be possible to determine the work in versus the work out of a hollow charged conductor with a carefully conducted, well-calibrated experiment. The principal problem would seem to be how to accurately measure the work out from conventional charge producing or separating devices. Is it possible that a more efficient and controllable device could be constructed using the following technique?

Charge a variable capacitor from a DC power supply when the capacitor is in the closed plate, maximum capacity position. Disconnect the power supply and then separate the capacitor plates so that mutual charge attraction is gone and each separated section has a "free" charge. Now, connect each section to the interior surface of a separate hollow conductor.

It may also be possible to combine the advantages of hollow conductors and capacitors. Stack a series of hollow flat wafers with dielectrics between each wafer. Connect the interior surfaces of every other wafer to one polarity of a charge separator and the remaining alternate spaced wafers to the other polarity. The exterior wafer surfaces are then connected in two alternating wafer groups, in the same order as the interior connections. The output from these exterior connections is then the power output and the interior connections group is the power input.

In summary, a basic question has been posed. Is it possible that a hollow charged conductor can act as an extractor of zero-point quantum energy at practical power levels? It is hoped that this question will generate serious interest and possible experimental efforts to answer it. ❑❑❑

About the Author

Mr. Creed received a B.S. in physics from Utica College of Syracuse University in 1953. He worked as a civilian engineer for the U.S. Air Force for thirty-two years, at the Rome Air Development Center in Rome, New York. He specialized in development of new military radar technology and radar system concepts. Since retirement, Mr. Creed has been revisiting the area of classical physics in search of new ideas and possible new interpretations of old assumptions. This paper is the result of one such search.

*950 South Kanner Highway #605, Stuart, FL 34994;
Phone: 561-220-0414; E-mail: durwoodcreed950@netscape.net

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PERSPECTIVE on the Hollow Conductor Paper by Durwood Creed

Richard Hull*

The paper by Mr. Creed is interesting in that it shows independent thought on electrostatics. However, it does have a problem in that the very concept of separation of charge is dealt with in a wrong manner.

Electrostatically, the idealized universe is conceived of as an infinitely large, closed sphere. Isotropically capacitive items, such as metallic conductors or polarizable non-conductors floating free in space, can be charged relative to this infinitely distant sphere. In actuality, the opposite or image charge of that applied to these floating conductors is found rather locally distributed. On Earth this is assumed to be ground or another object. A source of electrical energy can do work on the isotropic capacity, let us say a metal ball, and separate charge between the ball and infinity (or local objects), thereby raising the potential of the ball relative to nearby objects.

In all cases where an object is charged, a complete electrical circuit must exist to first do the charging and then to extract the energy of the charge for use. These circuits can be quite subtle and not involve classically thought of conductors or wires. In the more subtle cases we can make a generalized statement that all charged systems represent stored electrical energy between two oppositely charged entities separated by a dielectric. In this case it is air or even the vacuum or outer space.

Charge can neither be created nor destroyed, but can only be, hypothetically, moved about by doing work.

If we charge a rod in this universe, the opposite charge is actually pretty local, being on the wool rubbed against a hard rubber rod, for example. If we now touch a floating sphere with our charged rod, some of the charge transfers to the sphere over the outside surface. Likewise, if we take the charged rod and go in through a hole in the top of the sphere and touch the inside, the charge "pops out" to the outside surface. This is the surface closest to infinity and directly faces its mirror image charge in the universe in which the original charging was accomplished.

A totally enclosed conductor or sphere, with no holes, can be viewed as an electrically closed universe. This is very important.

An object charged in our universe can't charge the inside surface of another universe as the opposite image charge was created and exists in the larger outside universe in which the rod was originally charged. This is the classic Faraday ice pail experiment and is acknowledged by Mr. Creed in his paper.

The salient point is that it is very important to know where the charge was separated or work done and, therefore, the location of the opposite image of the charge.

A multi-joule electrostatic generator placed totally inside a 1 mm thick, 1 mile diameter, fully closed, conductive metal sphere can have its ground lead connected to the sphere. Its other lead can be used to charge innumerable beach ball sized metallic spheres within. The inside wall of the metal sphere would now hold the opposite image charge of all those small spheres placed around the inside of the larger sphere. This charge could never pop out to the outside for use in any manner.

Outside of this giant sphere, no experiment could be performed to determine that just a millimeter away, on the fully conductive ball, exists many joules of deposited charge energy. To speak of such matters would be absurd, for no matter what instrument you used outside of the big sphere, the charge separation occurred inside the sphere. The opposite image charges are all on isotropic capacities within the sphere. There are no opposite, related image charges outside the sphere to reference the meter reading. So the reading will be zero.

Let us now cut the most microscopic little hole in the giant sphere and pass the smallest of cables out from the generator's free lead and ground it here on Earth. Next, we run the generator with its other lead still connected to the big sphere's interior wall. All the charge would appear on the outside surface of the big sphere and not on the inside where the generator sits and is connected! This is because its opposite charge image is now on Earth, and all of the separated charge energy deposited on the inside of the sphere must face its opposite image charge on the outside. So you see, the location of the generator is of no significance whatsoever.

The relative location of the two points to which the mutually opposite, separated charge energy has been placed will determine what direction the charges face with a common dielectric medium intervening.

It must be remembered that, in reality, charge—as in extra electrons—is not resident or placed on the conductors here. The number of electrons in each conductor is forever constant. The energy source just supplied energy to the metal-dielectric-metal medium that has the capability of retaining or storing that energy. The precise point where the energy is stored is hotly debated to this day.

The idea of the origins of charge and its storage has absolutely no real world explanation. The concept of piling up an excess of electrons on one plate while draining them off of the other is as satisfying to the mind seeking understanding as it is ridiculous in helping us arrive at the true nature of the process. Language might appear to fail us here, but it is really only that we have no real knowledge of the physical realities involved! We can do experiments, we can observe, we can reduce to mathematics, we can predict and even engineer around every aspect of charge. What eludes us is how a capac-

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itor really stores energy.

The verbiage I have used is that chosen by a science which is well developed and understood. Useful, real world engineering is done daily on extremely complicated matters regarding charge and its separation. In the same breath, it is important to admit that science hasn't the slightest idea about the actual physical manifestation of charge storage. We have lots of analogs, models, and slick concepts, but no core knowledge of how energy is stored in the simple capacitor. The learned teachers tell us the energy is stored in a tensioned electric field, which is fine for illustration, but this is as ridiculous as it is useful. In the same breath these folks who use the "spooky" field concept laugh at those who hold to the concept of an aether. This seems, to the unbiased, thinking mind, as if the pot is lecturing the kettle. What results is a classic case in point where clever sophistries and well thought out analogies can teach basic concepts and get ideas across. Also, where experimental observation is made and accurate and consistent mathematics allows advancement of knowledge and useful engineering to be done. Yet, the gut of the issue is still not understood at its most basic level.

To sum up, I feel that Mr. Creed's idea is flawed for reasons given in the above discussion.

Mr. Creed has merely forgotten where his work is being done and where the image charges are in relation to the dielectric. He has also assumed a possible net gain in energy. That gain is offset and energy is conserved by having to force the charged rod past the like surface charge on the ball to be able to touch the inside and have the new energy "pop out" on the other side. In reality, generating charge energy inside a closed conductor would have no return point outside of the conductor. If it does (connected to an outside world ground point), then it is the same as charging the conductor from the outside.

Moving a charging point from the outside of a conductor to the inside will not save energy or get us any free energy if the source of charging energy is outside of the conductor with its image charge on Earth or at infinity.

Moving the entire source of the energy generation to the inside of the conductor would place the charge on the inside of the conductor with no reference to the outside world where we need the work done to complete the circuit for charge usage.

Energy is conserved both inside and outside of the conductor. The same work is required to apply charge in both universes. The energy available due to original charging is only found between the two originally charged objects on either side the original dielectric. ❑❑❑

About the Author

Mr. Hull is a lifelong amateur scientist. In 1966, he earned his degree in electronics engineering from the Richmond Professional Institute (currently Virginia Commonwealth University). Mr. Hull is currently employed by The Whitlock Group (Richmond, Virginia) as an electronics systems engineer. He has been a rather constant, active experimenter in electronics and physics since 1956. He is a member of the Electrostatic Society of America, as well as numerous amateur scientific groups. Mr. Hull has published papers in various technical and trade journals, such as the *Amateur Scientists of America Journal, Electric Spacecraft Journal, Tesla Coil Builders Association News, R&D Innovator,* and *The Bell Jar;* he has published one peer-reviewed scientific paper in *The Journal of Plasma Physics*. Mr. Hull's current projects underway include nuclear fusion studies with the Farnsworth Fusor, electrostatic experiments related to propulsion, and charge separation study.

* 7103 Hermitage Road, Richmond, VA 23228
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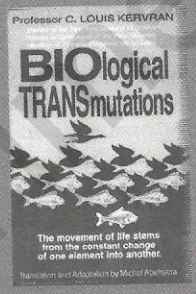

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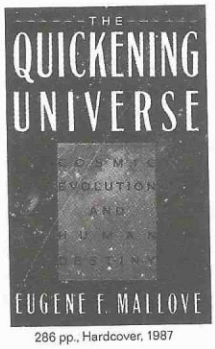

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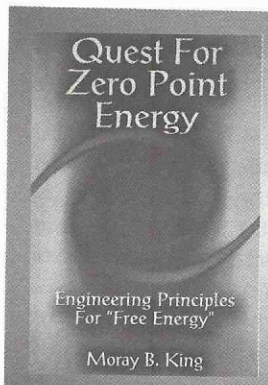


Quest for Zero-Point Energy: Engineering Principles for "Free Energy"

by Moray B. King
ISBN 0-932813-94-1
$14.95 Paperback, 224 pp.
Adventures Unlimited Press, 2001

Review by Eugene Mallove

This is Moray King's second book on the possible technological applications of so-called zero-point energy ("ZPE") of quantum mechanics. It follows the format of his first work, *Tapping the Zero Point Energy* (Paraclete Publishing, 1989), which was released in the year of the cold fusion announcement. From his academic studies, King had become convinced by 1976 that tapping ZPE was a serious possibility—*before* he learned about his coincidental namesake, T. Henry Moray, who earlier in the twentieth century had exhibited alleged "free energy" devices. Both of Moray King's books are collections of well-referenced and footnoted technical essays, each written one or two years apart (a date from 1991 to 2001 is designated for each of the nine chapters in this latest book), which give electrical engineer King's then current appraisal of these technical possibilities.

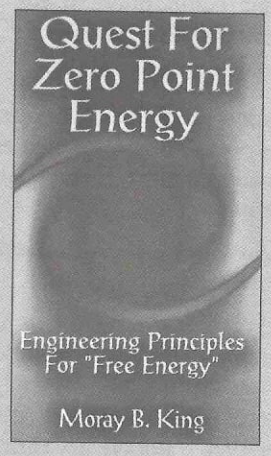
This work, as indeed was King's earlier book, is well-written, well-illustrated, and will be understandable to both general and technical readers. Its primary virtue is its compendious referencing of source material in the technical literature of zero-point energy and related works—both theory and experiment. King links these together in plausible scenarios of how "ether" energy (King's somewhat loose, alternate designation of ZPE) might be tapped technologically. As such, he plays freely with the published experimental results of investigators such as the Correas of Canada (with their XS NRG™ Pulsed Abnormal Glow Discharge, PAGD, reactor). King does not provide a detailed mathematical description of how the ZPE is to be tapped—such is only offered up in terms of the possible physical linking, in descriptive form, of ZPE to the macrophenomena that have been reported. Thus, his approach is certain to both please and displease various experimental camps and theorists with their particular perspectives. Fair enough. King's work is still a useful starting point for shaking up the reigning paradigm that *seeming* "perpetual motion" machines are impossible.

As has been repeatedly stated by workers in the "free energy field," it is the novelty of the *source* of the new energy that makes the seeming "perpetual motion" possible, not that *something*—macroscopic, coherent energy—is literally being obtained from *nothing*. Energy conservation is not violated.

If there is a single descriptive paragraph in this work that summarizes the range of ZPE-devices that King reviews, it is this (p. 23):

> Applying the principles of system self-organization to the theories of the zero-point energy suggests that an appropriate system might be able to induce a coherence in the action of the zero-point energy. Quantum electrodynamics shows that the ZPE intimately interacts with the various elementary particles with differing vacuum polarization dynamics. The vacuum polarization description of atomic nuclei suggests that abrupt, synchronous motion of ions or nuclei may be a good candidate for coherent vacuum energy activation. The observed anomalies associated with the ion-acoustic oscillation of a plasma might be evidence for this. Further circumstantial evidence may arise from the claims of different investigators and inventors whose devices exhibit a common modus operandi: They utilize coherent, synchronous motion of ions or nuclei.

In an "Afterword" to this work, King adds a concluding philosophical remark and encouragement: "It just might be that the discovery of the vacuum energy as a limitless energy source is to be synchronized with a spiritual renaissance of all of humanity. If so, the quest for zero-point energy broadens into a consciousness transformation at the planetary level. Many feel their life's purpose is to help with this transition. You know who you are. If you feel this way, welcome to the quest!" Very nice sentiments, but it makes one wonder whether we may be in a Catch-22 situation: The failure so far to commercialize limitless, clean energy devices may be precisely *because* a global (or local!) consciousness transformation has not yet occurred, which will allow that great leap into the free energy age. ❐❐❐



Quest for Zero-Point Energy:
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Compiled by Eugene Mallove

Mitsubishi Nuclear Transmutation Paper Published

Mitsubishi Heavy Industries' seminal paper on fully reproducible transmutation of chemical species—by permeating deuterium gas through palladium and other films—has been published by the prestigious *Japanese Journal of Applied Physics*. It is a magnificent paper, an historic landmark in the saga of cold fusion. The paper is available electronically; to download it, simply register at: http://jjap.ipap.jp.

We provided a general description of the Mitsubishi methodology in the last issue of *Infinite Energy* in our coverage of ICCF9, which was held in Beijing in May. Authors Iwamura, Sakano, and Itoh submitted a *less* comprehensive version of the paper to the proceedings of ICCF9, which will be published in a future issue of *Infinite Energy*. Here are the particulars and the abstract of the *JJAP* paper.

"Elemental Analysis of Pd Complexes: Effects of D_2 Gas Permeation," Yasuhiro Iwamura, Mitsuru Sakano, and Takehiko Itoh, *Jpn. J. Appl. Phys.*, Vol. 41 (2002) 4642-4650, Part 1, No. 7A, 15 July 2002, (DOI: 10.1143/JJAP.41.4642), Advanced Technology Research Center, Mitsubishi Heavy Industries Ltd., 1-8-1 Sachiura, Kanazawa-ku, Yokohama 236-8515, Japan

(Received July 18, 2001; revised manuscript received February 1, 2002; accepted for publication April 9, 2002)

Abstract: Elemental analysis of Pd complexes, which consist of a thin Pd layer, alternating CaO and Pd layers and bulk Pd, is described, after subjecting the Pd complexes to D_2 gas permeation. The Pd complex was located in a vacuum chamber and the elemental analysis was performed using an X-ray photoelectron spectroscopy (XPS) apparatus mounted on the chamber. When Cs was added on the surface of a Pd complex, Pr emerged on the surface while Cs decreased after the Pd complex was subjected to D_2 gas permeation at 343 K and 1 atm for about one week. In the case of adding Sr on the surface, Mo emerged on the surface while the added Sr decreased after D_2 permeation for about two weeks. All the phenomena were reproduced qualitatively. The isotopic composition of the detected Mo exhibited characteristics indicating an isotopic abundance of Sr rather than the natural abundance of Mo.

If internet discussion traffic is any guide, predictably the paper is not winning over any skeptics. This paper further illuminates the continuing *willful ignorance* of mainstream chemistry and physics to spectacular new vistas in the microcosm.

APS Outlaws Free Energy

The American Physical Society (APS) is at it again. Its' thirteen-plus year trashing of cold fusion was apparently not enough to satisfy its blood lust against truly new physics. The APS's Executive Board has now passed a resolution firmly rejecting *all* free energy claims. *Voodoo* "scientist" Robert L. Park's "What's New" internet column of Friday, June 28 broadcasts the APS's attempt to legislate the "laws of physics":

FREE ENERGY: APS BOARD SPEAKS OUT ON PERPETUAL MOTION. Well, it's not exactly the frontier of physics research, but somebody had to say it. Already this year we've had the Jasker Power System (WN 25 Jan 02), Chukanov Quantum Energy (WN 8 Feb 02), and the Motionless Electromagnetic Generator (WN 5 Apr 02). Not to mention Bubble Fusion (WN 1 Mar 02), hydrino rockets (WN 21 Jun 02), and whatever scam Dennis Lee is running now (WN 3 May 02). So, on Saturday, 22 June, the Executive Board of the American Physical Society unanimously adopted the following statement: "The Executive Board of the American Physical Society is concerned that in this period of unprecedented scientific advance, misguided or fraudulent claims of perpetual motion machines and other sources of unlimited free energy are proliferating. Such devices would directly violate the most fundamental laws of Nature, laws that have guided the scientific advances that are transforming our world."

One must assume that the APS Executive Board considers cold fusion (low-energy nuclear reactions, LENR) to be a "source of unlimited free energy." However, APS mouthpiece Park did not list cold fusion in his propaganda; either he is softening toward cold fusion, or (much more likely) he thinks it is so thoroughly killed off it doesn't bear mentioning.

NASA Propulsion Project to Test Mills' Hydrinos

Indeed, NASA has given a small contract to test out the efficacy of "hydrinos"—shrunken hydrogen atoms, experimentally and theoretically claimed by Dr. Randell Mills and his colleagues at BlackLight Power Corporation (www.blacklightpower.com). Here's how Park handled this in "What's New," June 21, 2002:

HYDRINO ROCKETS: PASCAL'S WAGER IS ALIVE AND WELL AT NASA. According to a story in *Wired*, NASA's Institute for AdvancedConcepts is funding a study to test the feasibility of powering a rocket by the hydrino process. A call to the Director of the IAC in Atlanta confirmed that an engineering professor at Rowan University will conduct the test. According to Randell Mills of BlackLight Power, if ordinary hydrogen atoms make a transition into "a state below the ground state," they become teeny little things called "hydrinos," liberating large amounts of energy. It's all in Mills' "Grand Unified Theory of Classical Quantum Mechanics." Is NASA taking this wacky notion seriously again? Should we remind NASA that it tested the hydrino claim ten years ago when BlackLight Power was still called HydroCatalysis? NASA was looking for a way to power a mission to Pluto. Results were "inconclusive." That's NASA talk for "it didn't work."

The actual electronic article that triggered this tempest was by Erik Baard, who has been active in covering Mills' work:

http://wired.com/news/business/0,1367,51792,00.html

Baard reported that Anthony J. Marchese, a mechanical engi-

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neering professor (with a Ph.D. from Princeton) specializing in propulsion at Rowan University has received $75,000 from NASA's Institute for Advanced Concepts "to build and test a BlackLight Rocket." Baard revealed this interesting connection: "Marchese's colleague at the Rowan College of Engineering, associate professor of electrical engineering Peter Mark Jansson, researched the BlackLight process while employed by Mills' backer Atlantic Energy, now part of the utility Conectiv."

Why would NASA be interested in testing Mills' hydrinos in a propulsion system? It happens that the important efficiency characteristic of a rocket, its specific impulse, is proportional to the square root of the quantity, absolute combustion temperature divided by the average molecular weight (MW) of the exhaust products, that is: $Isp = k[T/avg.MW]^{1/2}$. Specific impulse (in units of seconds) multiplied by "little g" (9.8 m/sec^2) gives the rocket's exhaust velocity in m/sec, the all-important driving factor in how efficient or good a rocket is for space travel. Therefore, keeping the average MW of exhaust products very low is as critical to rocket propulsion as the elevated temperature of combustion or any other heating process, such as by the thermal energizing of hydrogen gas by a solid, liquid, or gaseous fission core rocket.

In fact, in the 1960s, the NASA-demonstrated high Isp of solid core fission rockets (in ground tests in Nevada)—about 800 seconds Isp—was due more to the exhaust product's average molecular weight being closer that of to H or H_2, rather than H_2O, as in the current shuttle main engine LH_2/LO_2 combustion (Isp near 450).

So, Prof. Marchese will probably be testing the Isp of his test bed Mills hydrino rocket. Based on a combination of the measured T and the inferred avg.MW of the exhaust (based on Isp test-bed measurement), Marchese might be able to demonstrate not only a good propulsion efficiency using hydrino plasma, but might also be able to draw conclusions about the likelihood of the exhaust species being close in avg.MW to H. This is just speculation, but I think it is reasonable.

Park's use of the term "inconclusive" is simply propaganda. The word "inconclusive" does not appear in the NASA technical report in any summary statement or any statement at all that I can locate (NASA TM 10777167), which *Infinite Energy* published *in full* in Issue #7, March/April 1996. The report was very high quality. The authors went step by step and ruled out virtually all error sources except the possibility of recombination of hydrogen and oxygen, though deemed by the researchers as unlikely. The authors suggested more study was in order, given the extreme possible payoff. *That* was the central and up front message of the report, not that it was "inconclusive." In fact, this report subsequently led to the highly successful MIT Lincoln Lab reproduction with the same size (28 liter) cell (at a cost to U.S. taxpayers of $75k). Unfortunately, this report, which closed off the recombination issue and in which other refinements were made, has not been released to the public, for "politically correct" reasons. I have seen the report under non-disclosure agreement.

Mills and his colleagues at BlackLight Power continue to publish spectacular data. A recently released water bath calorimetric study of a helium/hydrogen plasma, posted at the company site, is exemplary: "Plasma Power Source Based on a Catalytic Reaction of Atomic Hydrogen Measured by Water Bath Calorimetry." The paper describes a 90%/10% helium/hydrogen plasma with a power gain of 3.7 (8.1 W ± 1 W of microwave power in and 30 W ± 1 W of thermal power out).

Another Second Law "Loophole"?

Most physicists would rather die than entertain the possibility that the Second Law of Thermodynamics might be fundamentally flawed, or contain significant, possibly technologically useful loopholes. Readers of *Infinite Energy* know, through some of our articles that question the universal validity of the Second Law, that Second Law violations have been a focus of a handful of investigators in the new energy field. We have just received word that an article in *Physical Review Letters* (July 29, 2002, Vol. 89, 050601) may have provided new support for such thinking.

Dr. David Whitehouse of the BBC reported (July 18, 2002) that Professor Denis Evans and colleagues of the Research School of Chemistry at Australian National University have published a paper that finds a *reduction* in entropy under certain circumstances.

The experiment involves a container of 100 tiny beads in water suspension. A focused laser beam traps a bead in the container, which is then shaken at kilohertz frequency. This apparently leads to the trapped bead being dragged from side-to-side with respect to the container. A demonstrable entropy reduction is found, provided the period of observation is 0.1 seconds or less. Such a time interval is huge, of course, with respect to molecular interaction times. So, is this merely an expected statistical effect during a transient period, or is it a novel phenomenon with grander implications? The BBC reporter quotes the researchers: "This result has profound consequences for any chemical or physical process that occurs over short times and in small regions." Hmm? That would seem to characterize virtually *all* chemical processes! Perhaps a way might be found to extend the anomalous entropy decrease to larger regions? (See article by Kevin Varner in *IE* #43, which may have relevance to this discovery.)

The *Physical Review Letters* paper's abstract:

> "Experimental Demonstration of Violations of the Second Law of Thermodynamics for Small Systems and Short Time Scales," G. M. Wang,[1] E. M. Sevick,[1] Emil Mittag,[1] Debra J. Searles,[2] and Denis J. Evans[1] (1. Research School of Chemistry, The Australian National University, Canberra ACT 0200, Australia; 2. School of Science, Griffith University, Brisbane QLD 4111, Australia)
>
> We experimentally demonstrate the fluctuation theorem, which predicts appreciable and measurable violations of the second law of thermodynamics for small systems over short time scales, by following the trajectory of a colloidal particle captured in an optical trap that is translated relative to surrounding water molecules. From each particle trajectory, we calculate the entropy production/consumption over the duration of the trajectory and determine the fraction of second law–defying trajectories. Our results show entropy consumption can occur over colloidal length and time scales.

Of the significance of the Australian work, Whithouse writes: "The finding has implications for nanotechnology—the design and construction of molecular machines. They may not work as expected. It may also help scientists better understand DNA and proteins, molecules that form the basis of life and whose behavior in some circumstances is not fully explained." ❑❑❑

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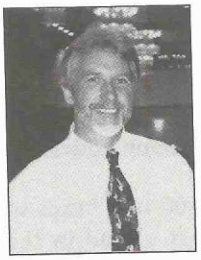
Comments by Dr. Michael McKubre of SRI International

Closing Session of ICCF9, Beijing, China

(May 24, 2002)



I would like to begin by thanking Professor Li and the whole organization of our Chinese hosts, from the senior professors and academicians to the students and staff here in the hotel. . .

By way of historical perspective, the ICCF steering committee tried three times to hold the conference in China. For a variety of reasons we failed twice, and I think that this was probably a good thing, because the time it is now far more appropriate for a conference in China. I am being philosophical this morning. I think that the effect we are studying here, from an energy perspective, will make the greatest difference to one country on the surface of this Earth; that country is China. I suspect that China stands to take more advantage of what we are doing than any other nation.

India could take advantage of it, but the work in India seems to be proceeding very slowly, and it doesn't appear to have government support. Here in China, the work is moving rapidly and effectively, and seems to have at least some level of governmental support. This makes me comfortable that there is an awareness and understanding of the potential.

None of that has to do with experimental work, which is what I'm supposed to be talking about.

To me this is a somewhat surprising conference. I guess they are all surprising, but I keep in touch with most of you sufficiently closely that I'm often not at all surprised by what I hear in the conferences. Here I was surprised by two things: what was said, and what was not said. I heard a lot of new things and new perspectives on old experiments, some of which I must confess I had pushed to the back of my mind as being not interesting or not primarily important. Many of you have caused me to reevaluate my position, and I have to think much harder now. That's not always a good thing.

What was not said? Well, in the beginning. . .The beginning for most of us was March 23, 1989. In the beginning, anything was possible, absolutely anything. The doors of imagination were opened wide. To me, the most exciting of all of the conferences in this [ICCF] series was the conference organized by my good friend, now sadly and dearly departed Giuliano Preparata. The conference in Como [ICCF2, June 1991] was such a zoo. We were all jammed in one room, there was no order, theory papers, materials papers, nuclear measurements, and heat papers were all mixed in together. Like someone throwing stones into the audience, we were constantly bombarded. I think we worked from 7:00 a.m. until 7:00 p.m., continuously being pummeled by new ideas. I was a younger man then, better able to handle it. But for me it was the most vital, exciting, and liberating—scientifically liberating—experience of my career.

We got a little boring after that. Things settled down as we studied what really are the concrete blocks of what I understand to be the cold fusion effect. Concrete blocks: 1) the deuterium palladium system, 2) excess heat, 3) high loading, and 4) helium-4. The heat work was inspired and spearheaded by Fleischmann and Pons, but virtually everybody else was dabbling in the demonstration and revelation of heat. The loading and its association with the heat effect was talked about by Keiji Kunimatsu and very heavily worked on by the members of his group. My own group [at SRI] also worked very strongly on the coupling of the thermodynamic loading—how much D you can stuff into the palladium lattice—and its association with the heat effect. Helium-4 is the concrete observable of all of this heat activity, and Mel Miles (who is here today) really opened all of our eyes to the coupling of the heat and helium-4 effects—Mel Miles and Ben Bush. Also working very strongly on that coupling were several different workers in Italy, particularly Daniele Gozzi at the University of Rome, Francesco Scaramuzzi of ENEA (Frascati), and Tulio Bressani in Torino. I mention those three particularly because they are not here. They have done superb work. They have made incredible contributions to this field. They are not here and I miss them. I think it is sad that we are losing people. People of that caliber are sort of being left behind. I don't know if it is because we're moving too fast, or because we're not moving quickly enough.

I bring those concrete blocks up, because they really were not discussed at this conference. There was very little elaboration of the heat and helium effects in "boring old" palladium deuterium systems. What was discussed suggests, or suggests to me, that the high loading of deuterium into palladium is *not* necessary and *not* sufficient. At a certain point in my life, when I thought I understood something, my single picture was: "high loading of deuterium into palladium is a necessary and sufficient condition for the heat effect." Well, it may very well be that this condition is neither necessary nor sufficient. There was a fair amount of work discussed here on the hydrogen/nickel system. Prof. Ota really caused me to scratch my head and reevaluate my position with his rather unambiguous and clear demonstration of a heat effect from what was once called the Patterson cell, or some derivative thereof. Les Case's work. . .Yes, it is deuterium and palladium, but the degree of loading you can achieve at one or two atmospheres of gas pressure in a palladium system at 200°C is very low. The equilibrium atomic loading of D into the palladium lattice at

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that point is 0.2. or less. The threshold value that my group developed was 0.85, so Les clearly fails to meet "my" loading criterion amount. And yet he obtains evidence of heat and helium-4. Vittorio Violante's work discussed yesterday was mostly nickel/light water work, some with small additions of deuterium to it. But he has evidence of X-rays, that horrible "transmutation" word—the "T" word—and evidence of some new isotopes appearing in the material. The thing that has really emerged here is what I have called, and what Dr. Iwamura has called, the third element—the important involvement of an element other than palladium and deuterium. The other thing to emerge is the importance of flux.

I have a viewgraph you have seen before. What I have said is: "We are concerned with the host lattice and its minor constituents." This is the same as the third element. We are interested in palladium and we are interested in something beyond palladium. That "thing" beyond palladium, of course, can help you or it can hurt you, and 99.9% of the time it actually hurts you. But when you finally find the third element that helps you, it apparently plays a very crucial role in yielding the effects that we're looking for. (Referring to viewgraph) "Fuel activity" is loading. "System stimulation" can be very many things. Necessary stimulation can be introduced by an electrical current. In experiments first at Milano and now at Frascati pioneered by Giuliano Preparata the stimulation is provided in part by strong axial current flux. The flux of material is also important and was very much discussed at this conference. In fact, I did a small statistical survey this morning. Something like 50% of the papers at this conference, including both theory and experiment, discuss the issue of flux as a driving force for the effect. When Dr. Iwamura described his three requisites for the effect, he listed first the third element—and at MHI they work with low work function materials, calcium oxide in his case. The deuterium flux came second. And this loading "thing," which was once the most important feature of our experiments, was the third thing on his list. Flux, the rate of change of loading, has become the issue of primary concern and interest where loading, the thermodynamic effect, was once the primary factor of importance. There is strong theoretical support for this concept, which my colleague Dr. Hora may choose to speak about. There is strong experimental evidence of the need for fluxing of material through the interface.

I have heard Martin Fleischmann say on more than one occasion—and always raising his eyebrows—that he is "a very conventional scientist." It's true, as a scientist. Yet he chose to work in what has become known as a rather unconventional field. Well, I am a very conservative scientist, certainly a very conventional "cold fusion" scientist. And in general I have resisted the expansion of the field. I resisted the extension of the field into biological nuclear effects, into consideration of the sort of rotating magnetic machines Gene Mallove's magazine keeps us informed about, and into the concept of "zero-point" energy. I just resist the idea of zero-point energy. Nickel/hydrogen studies—the possibility of heat from nickel/light water experiments—I have resisted. And I have resisted the concept of transmutation, that somehow we can change higher mass elements from one isotope into another. It isn't that I think these effects are not well-observed or well-disclosed by able people. My resistance really is, I resented the diversion of focus of attention from what was already a very difficult problem. In general those effects are just too easy for our critics to attack and use as sticks to beat us with. At least for the heat effect, possibly also tritium production from nickel/light water experiments with small additions of deuterium, and for the yielded evidence of new nuclear isotopes—at least for those two things and at least for me, I think the time has come to change. My prejudice must change. I have to abandon my objections and pay much more attention to what is being said about the yielding of new isotopes, and the possibility that nickel/hydrogen systems are representative of the same phenomenon that was observed by so many in the deuterium/palladium system. These effects seem to me to be quite clearly exposed in experiments that are scientifically defensible. The work has been performed by very studious researchers with very clear exposition of the systematic errors that might possibly be associated with such experiments. This work has been going on for a number of years and has been accumulating a weight of evidence that I think we must just accept. More particularly, I think that these effects are physically consistent. By this I mean consistent in terms of their fundamental physics with the phenomena of heat production and helium-4 production that many of us have observed in the deuterium palladium system. We will have common theory to describe these effects.

I have another viewgraph that I was debating whether to show or not. It is somewhat pessimistic. I was asked to give a lecture by Martin Perl. He is a Nobel laureate and a physicist at Stanford. He wanted to know what I thought the future might hold. I generated this viewgraph in a probably more pessimistic frame of mind than I presently am in. In it I argue that the chance that we will continue to get governmental support for the study of phenomena that are essentially of scientific or "only scientific" interest is very small. We have had a decade or more of government supporting our science. "Real" people support practical economic objectives. I don't think the government is going to continue to support this—at least not in the United States to any degree, and certainly not to the degree that we need to come to grips with the basic phenomena. So, the chances of that happening, I argue, are something like 5%. If we are going to move forward with the strengths—economic strength, the number of people, and the facilities that we need—I think that the money in the U.S. has got to come from some sort of private initiative. For this we have to be able to demonstrate some plausible derivative towards one of the things that I have listed here:

* Low-grade heat. That is heat up to 100 or 110°C, which can be used for space heating, curing materials, and so on.

* At higher source temperatures (250-350°C) we might be able to drive steam generators for utility power production. At higher temperatures we might be able to get direct thermal conversion using thermoelectric or thermal-photovoltaic schemes.

* Sadly, in all of this, we have tritium production. This is another thing that I resisted—the notion that tritium is being produced in these experiments. Tritium production is *absolutely, unambiguously, clearly evident*, and of *no small quantity*. And tritium is a product which has value and use.

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Not good uses in all cases! But it has value and use, and can be used as an argument to raise money for the development of the resources that we need to resolve this field.

* There is also the possibility that, given my very grudging acceptance of this concept of transmutation, we might be able to use that effect to create "good" isotopes, or destroy "bad" ones.

Again, remember my caution that this analysis was produced in a more pessimistic frame of mind before the evidence and stimulation of this conference and assembled group. There is at least a 50:50 chance that we are going to die out. That the field will slowly fade away as we all get older and slightly more incoherent year after year. The phenomenon *is* real. The effects *can't* die away. We can just lose this opportunity. The field will be pursued by amateurs, retirees, and hobbyists and we will publish our work in conference proceedings. This can go on for a long time. But in doing so, we do not break forward into the mainstream. What will happen, of course, is that it will all be forgotten. In some way, in some bright new future, a physicist will come up with a "wonderful new discovery." And the wonderful new discovery will be just what we are doing today, and what we are talking about here.

Editor's Comment on Mike McKubre's "Closing Comments":

First, we are extremely grateful to be able to publish Dr. McKubre's perceptive and eloquent remarks made at the close of ICCF9 in Beijing. As always, he managed to capture the essence of where the cold fusion (LENR) field stands today, and where it may or may not be in the future. He quite correctly notes that R&D money for LENR (at least in the U.S.) must come from a private initiative, which in turn requires us to ". . .be able to demonstrate some plausible derivative towards one of the things [practical applications] that I have listed here." Indeed, this "plausible derivative" is nothing less than a reliable demonstration device, a repeatable (on demand) device with evident commercial prospect, if scaled up.

It was gratifying also to hear Dr. McKubre state candidly, ". . .in general I have resisted the expansion of the field." He enumerates the sorts of things that he has resisted, such as heavy element transmutation, excess heat from light water, biological transmutations, and, of course, energy coming from plenums such as "zero point energy." He then explains that he feared the diversion of resources from "already a very difficult problem." His prejudice, he says, must now change. Excellent! I am happy to note that a luminary in the LENR field is willing to step out of the conservative line, which I described in my last editorial, "The Boundaries of Cold Fusion." Perhaps we will not get Mike—just yet—to pay attention to expanded theories of zero-point or aether energy, but at least we have graduated to "grudging acceptance" of transmutation, and that is a blessing. Progress is being made. Perhaps after all is said and done there will be a life—or an "afterlife"—for cold fusion, as we move toward what we all hope will be a triumphant ICCF10 in Cambridge, Massachusetts in late August 2003. Be there! —*EFM*

Cosmic Rays Linked to Global Warming

PRESS RELEASE No. 02-26, July 30, 2002, American Geophysical Union, Washington, D.C.— Researchers studying global warming have often been confounded by the differences between observed increases in surface-level temperatures and unchanging low-atmosphere temperatures. Because of this discrepancy, some have argued that global warming is unproven, suggesting instead that true warming should show uniformly elevated temperatures from the surface through the atmosphere. Researchers have proposed a theory that changes in cloud cover could help explain the puzzling phenomenon, but none—until now—have come up with an argument that could account for the varying heat profiles.

A study in the July 2002 issue of the *Journal of Geophysical Research-Space Physics*, published by the American Geophysical Union, proposes for the first time that interstellar cosmic rays could be the missing link between the discordant temperatures observed during the last two decades (since recorded satellite records began in 1979). The report, by Fangqun Yu of the State University of New York-Albany, proposes that the rays, tiny charged particles that bombard all planets with varying frequency depending on solar wind intensity, may have height-dependent effects on our planet's cloudiness. Previous research has proposed a link between cosmic rays and cloud cover, has not suggested the altitude dependence of the current study. [Fangqun Yu, "Altitude Variations of Cosmic Ray-Induced Production of Aerosols: Implications for Global Cloudiness and Climate," *Journal of Geophysical Research-Space Physics*, July 2002, American Geophysical Union. Citation to the online version is: 10.1029/2001JA000248.]

"A systematic change in global cloud cover will change the atmospheric heating profile," Yu said. "In other words, the cosmic ray-induced global cloud changes could be the long-sought mechanism connecting solar and climate variability."

The hypothesis, if confirmed, could also shed light on the Sun's role in global warming. The amount of cosmic rays reaching Earth depends on solar winds, which vary in strength byspace-weather conditions. Yu points out that indications of Earth's warming have coincided with decreased cosmic ray intensity during the twentieth century. Such explanations for natural causes of global warming do not rule out human contributions to temperature change, but present the possibility that humans are not solely responsible for some of the observed temperature increases.

In addition, recent satellite data have revealed a correlation between cosmic ray intensity and the fraction of the Earth covered by low clouds. Yu proposes that the amount and charge of cosmic ray-generated ions can contribute to the formation of dense clouds by stimulating the production rate of low-atmosphere particles that make the clouds more opaque. In addition, natural and man-made differences in atmospheric chemistry, like greenhouse gas concentrations, can also affect the cosmic rays' influence on clouds, according to Yu. Such height-dependent atmospheric differences can increase the quantity of ambient particles in the lower troposphere and decrease the particles in the upper air, thus affecting the type of cloud cover.

High clouds, for example, generally reflect sunlight, while lower clouds tend to retain surface energy; both effects are scientifically well established and have a significant effect on global temperatures. The data provides evidence supporting Yu's claim that cosmic ray-induced cloud changes may have warmed the Earth's surface but cooled the lower troposphere, which could provide an explanation of the Earth's varying temperature trends.

The research was supported by the National Science Foundation.

New Energy Times Archive

In Memoriam: Art Rosenblum

Art Rosenblum, an advocate for new energy who was prolific in his Internet activism, died in an automobile accident June 5, 2002 at age 74. *Infinite Energy* Issue #17 (1997) featured Rosenblum's memorable and lengthy interview with Dr. Randell Mills of BlackLight Power, Inc., one of the leading companies in the new energy field.

Art Rosenblum broadcast many other counter-cultural views, which could be pleasing or offensive depending on the listener. His wife Judy sent us a lengthy obituary, from which we have excerpted these passages, which describe a most unusual free spirit:

"He was a peace activist since the 1960s, a writer, printer, pilot, mechanic, and inventor. Art lived in the future. He called himself a futurist. He had a clear vision of the planet ruled by love. When he was 20, he went to Paraguay to join the pacifist Christian community called the Society of Brothers, where they followed the teachings of Jesus and held all things in common. He lived with them until he was 38, when he struck out on his own. For two years, he traveled all over the country setting up print shops for any group that opposed the Vietnam War, asking only room and board in communes along the way.

"In 1969, he came to Germantown, Philadelphia to start a commune devoted to finding ways to bring about a whole new age of peace and love to the world. He created a small nonprofit organization called Aquarian Research Foundation. He wrote a newsletter for over thirty years about alternative lifestyles, safe energy, psychic research, and sustainable living. The first five years of the newsletter are published in his book, *Unpopular Science*.

"Art had an offset press in his dining room, which he used to print newsletters and also a booklet on natural methods of birth control, which grew into a book that sold over 90,000 copies. When we married in 1976 after a 28-day courtship, I helped him edit the fifth edition. The next year, Art became a pilot at age 49 and started flying people all over to visit intentional communities. . .In 1988, he flew a Soviet social scientist to visit intentional communities in the U.S., and we wrote and produced the first video on such communities, called "Where's Utopia?" He influenced Ted Turner to create the Turner Tomorrow Award. . .

"He raised our two kids to be loving, free, creative, and caring about the needs of the world. He picked up every hitchhiker on the road that could fit in the car. He took in homeless people to live with us. He championed home birth, home schooling, polyamory, communal living, natural foods, alternative medicine, alternative energy, and every cause that came down the road. He flew his small plane to Cuba a few times at age 70. . .He promoted the Disclosure Project's efforts to get UFO information out in the open.

"At 74, 'seaweed man' still bounded down the stairs two at a time and built a loft with our daughter. He spent his last years writing articles to his listserv and teaching our son about electronics and politics. He started a free radio station which the FCC shut down. . .

"Art wanted a world without money where everyone's needs would be met. He deeply believed that if he worked for the universe, the universe would work for him. And it did, many, many times. We even managed to keep an airplane somehow, on a poverty level income, because he did his own maintenance.

"He never gave up trying. He said, 'The difficult things we do right away. The impossible takes a bit longer.' And he said death is just a change of lifestyle."—Judy Rosenblum (judyrosenblum@juno.com)

VOLCANIC HAZARD at Proposed Yucca Mountain Nuclear Waste Repository

Potentially Greater than Previously Thought, Researchers Say

PRESS RELEASE No. 02-27, July 31, 2002, American Geophysical Union, Washington, D.C.— A volcanic eruption might cause greater damage than previously thought to the proposed high-level nuclear waste storage facility beneath Yucca Mountain, Nevada. This, according to research presented by Andrew Woods of the BP Institute, University of Cambridge, United Kingdom, and colleagues this month in the journal *Geophysical Research Letters*, published by the American Geophysical Union. [Andrew Woods, "Modeling Magma-Drift Interaction at the Proposed High-Level Radioactive Waste Repository at Yucca Mountain, Nevada, USA," *Geophysical Research Letters*, Vol. 29, No. 13, 10.1029/2002GL014665, 2002.]

Yucca Mountain is located within a long-lived volcanic field. Risk assessments have suggested that the probability of volcanic activity occurring during the 10,000-year compliance period of the repository is around 1 in 1,000 to 1 in 10,000. However, because such activity could have a significant impact on public health and safety, Woods and his colleagues developed a physical model to understand some of the risks associated with volcanic disruption of the repository.

Eruptions from volcanoes located within 12 miles [20 kilometers] of the proposed repository have tended to produce small volumes of magma, or molten rock. However, the content of volcanic gases in the magma means that the eruptions have been quite explosive.

The model developed by Woods and others envisions that magma rising from below Yucca Mountain would form a narrow body of molten rock called a dike. The dike is hypothesized to cut through several of the repository drifts and be diverted into them. Upon entering a drift, the high gas content of the magma would cause it to expand rapidly.

Based on their models, the scientists found that magma in the drifts could reach speeds on the order of 200-600 mph [100-300 m/s], filling parts of the repository with magma within a matter of hours after the initial eruption. Flowing magma might displace canisters holding radioactive waste. Additionally, intense heat associated with the magma would be expected to cause extensive damage to the containers. The results suggest that a greater number of canisters could be affected than previously estimated. The researchers also suggest that the pressure associated with the magma could be sufficient to open new and existing fractures at Yucca Mountain, providing a conduit for material to reach the surface.

Woods and his colleagues note that although their models are simplified relative to the complex interactions that would occur in the repository during a volcanic eruption, the models are consistent with understanding of these types of eruptions. Therefore, while previous estimates suggest that the probability of a volcanic event may be very low, potentially significant impacts on the site during such an event warrants further research to fully assess the risk.

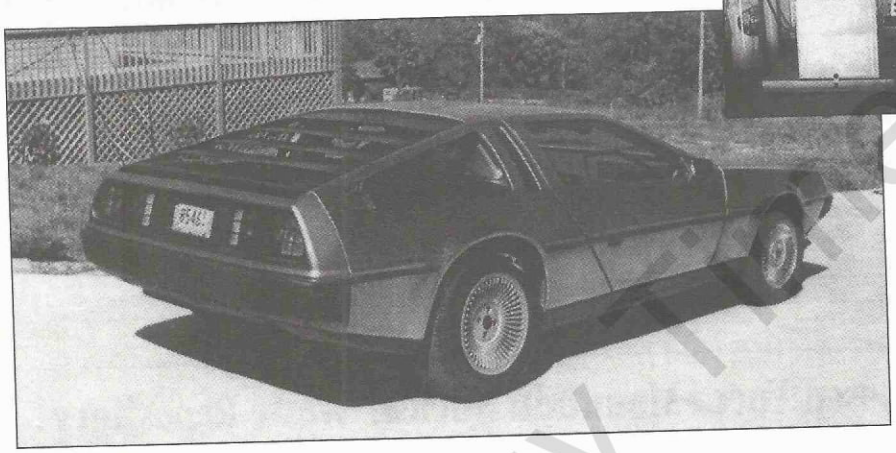
New Energy Times Archive

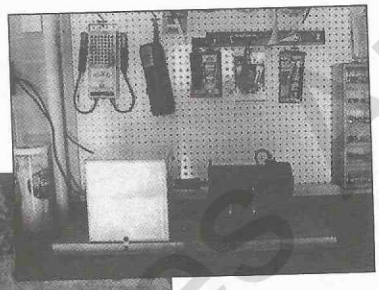
—NEWS RELEASE—

"Free Energy" Device in Speedway Demonstration

Eugene F. Mallove

Just as this issue of *Infinite Energy* went to press, a potential record-breaking event by an electric vehicle at the Nashville, Tennessee SuperSpeedway on Saturday morning (September 7, 2002) disappointed Tennessee inventor Carl Tilley and about a hundred other people attending the admission-free gathering, when a wheel bearing in his electrically-converted 1981 DeLorean car failed. See www.tilleyfoundation.com for the company's promotional material. The Tilley Foundation had rented the new SuperSpeedway for an expected all-day run to crush the world record for an EV of 220 miles (by a retrofit Geo-Metro).





Tilley claims to have invented a device that recharges batteries on-the-fly in automobiles and in fixed installations, using no evident fuel or power source (except whatever energy may be accessible from the space vacuum). A photo of this device in Tilley's lab (see photo) shows what looks like a very small electric motor with its output shaft penetrating an approximately one cubic foot metal box. Independent observers who have been to Tilley's facility say that this is the device that Tilley *claims* is also powering his building.

Tilley's car, retrofit with a conventional electric motor and controller (purchased from EV America of Wolfboro, New Hampshire), had to stop its planned multi-hundred mile demonstration after only about 18 miles of high speed driving (moving in the 70-90 mph range, observers estimated). Its left rear wheel bearing failed, making the car inoperable for more laps. An independent engineer from New York, who had driven to Nashville in *his* unconverted DeLorean, confirmed that DeLorean vehicles are particularly prone to such bearing failures.

Our colleague, engineer Jan Roos—who witnessed Saturday's demonstration—relates that Tilley and his associates promise another public demonstration soon, which will involve two vehicles: the DeLorean with new bearings on all wheels, and a retrofit SUV. They have also promised a demonstration of an electric-powered single-engine piloted aircraft, to be flown from Florida to somewhere in New England! Prior to the mechanical failure of September 7, the airplane flight was to have occurred before the end of October. Douglas Littlefield of Vermont, Tilley's spokesman, told me that they have obtained FAA approval for such a test flight.

Jan Roos inspected the vehicle as closely as possible, with its various compartments open, and found no evidence of any kind of auxiliary batteries or another concealed engine. Two of the compact Tilley devices, with drive belts attached, appeared to be near the engine, Roos said. In the rush to start the early morning, all-day run on Saturday, Roos was not able to measure the initial twelve 12-Volt Wal-Mart battery pack voltage. However, the voltage reading immediately after the car stopped was 137 V, measured by Roos' DVM. The pack recovered to 144.8 V within about 20 minutes. Chemical recovery of storage battery potential is a known phenomenon, of course. Tilley claimed to Roos that his device continues *some* of its recharge functioning after vehicle motor shut down. It is unclear what the average voltage of the battery pack would be during high-speed travel—assuming the recharging claims are valid at all.

Tilley and his associates claimed to Roos and others that the DeLorean had been driven 202 miles on a drive to Kentucky in the few weeks preceding the September 7 public test, which if true would be remarkable. Despite these dramatic claims, it is not possible at this time to draw conclusions about any anomalous performance of the vehicle. This must await further public demonstrations. It is noteworthy, however, that despite the embarrassing mechanical failure, there seemed to be no reluctance by the inventor and his business associates to promise further demonstrations—soon.

Prior to the September 7 test, Bob Batson of EV America in Wolfboro, New Hampshire told me that a 3,000 lb DeLorean equipped with twelve 12-Volt (130 Amp-hr) batteries would be expected to travel, at 60 mph, a maximum 52 miles, with an average stopping distance of 37 miles. This should put past and future claims by Carl Tilley and his associates in perspective.

Infinite Energy will provide continuing coverage of efforts to validate or disprove, publicly and privately, the very large claims of Carl Tilley and his associates. ◆◆◆

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HOT FUSION SPENDING:

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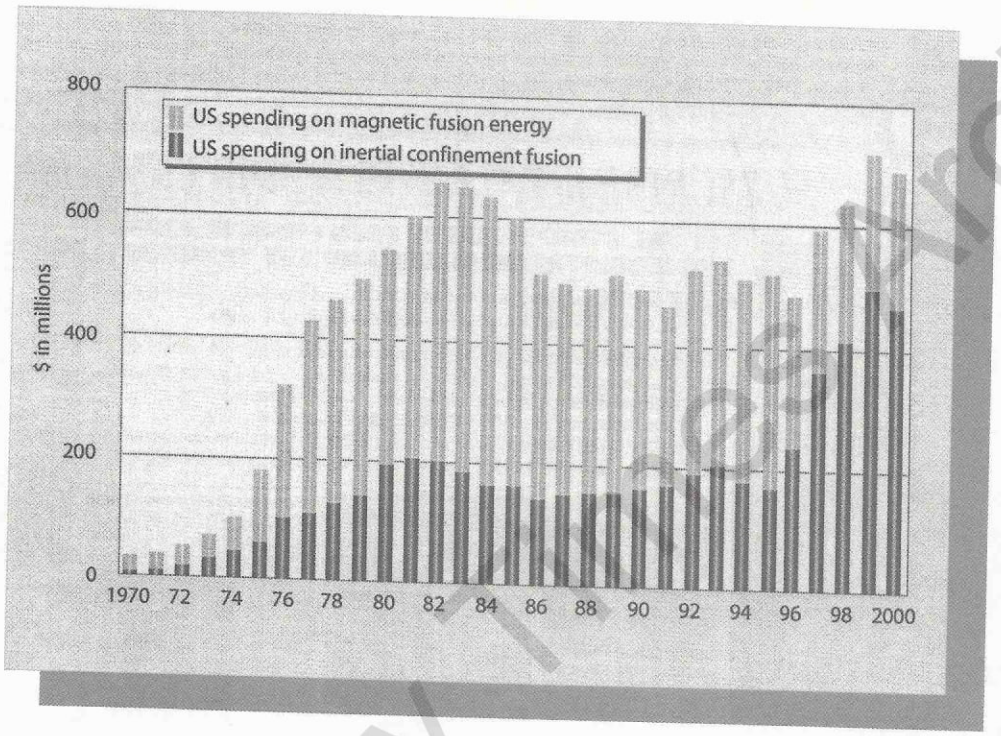

It is well known that the multi-decade quest for controlled *hot* fusion has consumed many billions of dollars—by the U.S. alone. There is a significant chance that no one in the U.S. government actually knows for sure how much money has been spent on hot fusion—not an unusual circumstance for some large Federal projects.

The accompanying chart, based on DOE figures (used with permission from *Nature*, April 22, 1999), tells the story of how many billions of dollars have gone to finance hot fusion, both magnetic confinement fusion (such as tokamaks) and inertial confinement (laser) fusion, such as the National Ignition Facility (NIF) in California. The chart would seem to suggest that on the order of $10 billion (in year 2000 dollars) has been spent on magnetic confinement fusion since 1970, but $15 billion or more is often the figure bandied about in the press. (Perhaps that accounting is based on work carried out beginning in the early 1950s.) Recently *The Economist* (July 18, 2002) stated that $17 billion has been spent on hot fusion since 1951.

In 1999, Congress mandated that the U.S. should abandon its participation in the multi-billon-dollar ITER (International Thermonuclear Reactor) project, which would have greatly increased U.S. magnetic fusion funding. But the hot fusioneers continued to plot their way back into that pork-barrel project. The cost of admission to re-enter the international collaboration might be from $500 million to $1 billion, reports *The Economist*, and there are signs that the Bush administration is leaning favorably toward ITER.

It has often been said that "hot fusion is the energy source of the future—and always will be." *The Economist* extended that old joke with a new observation: "Fusion science has made a big return on this investment in the form of a new universal constant. This constant is the number 30, a figure that has for the past half-century or so been cited almost religiously by researchers as the number of years that it will take before fusion power becomes a commercial reality." Later, this caution to young researchers in hot fusion: "Thirty years is a long time for an ambitious young physicist to achieve nothing at all."

—*EFM*

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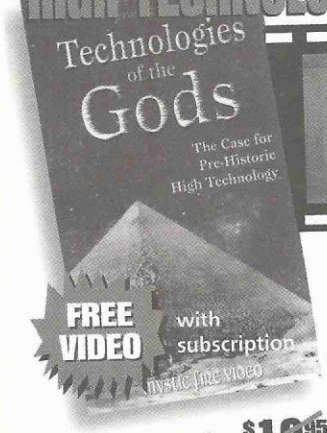
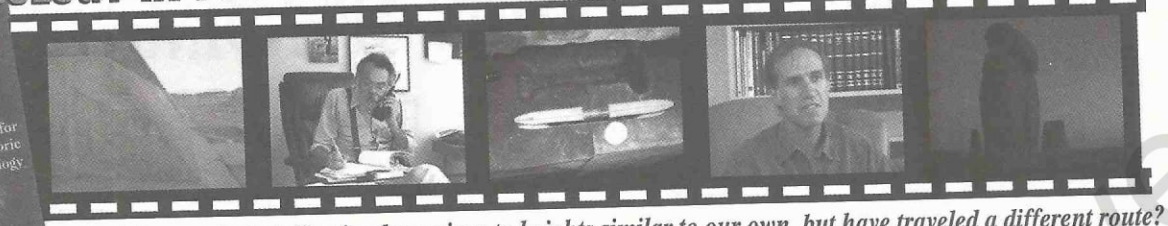
HIGH TECHNOLOGY IN PRE-HISTORY? WHAT DOES THE EVIDENCE SHOW?





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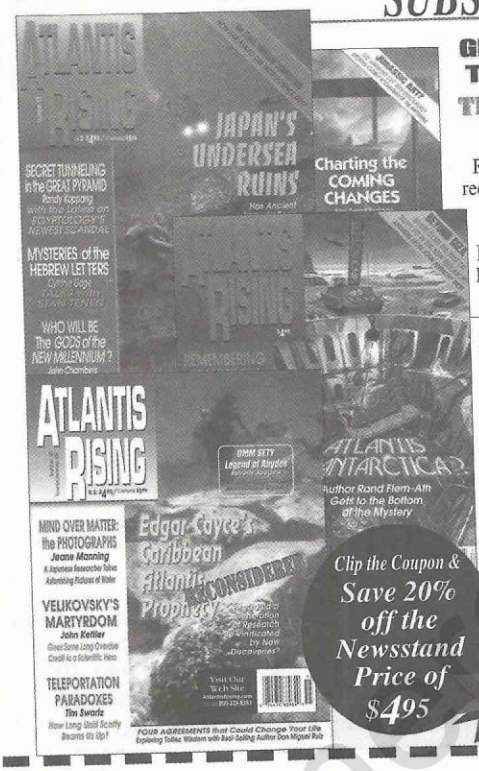

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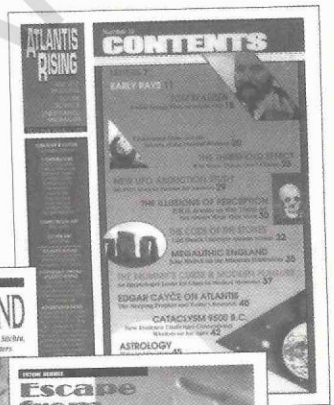

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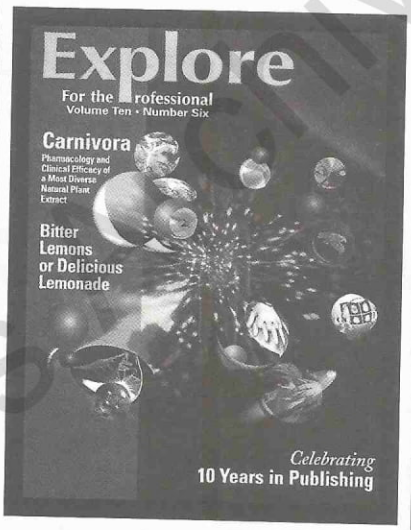

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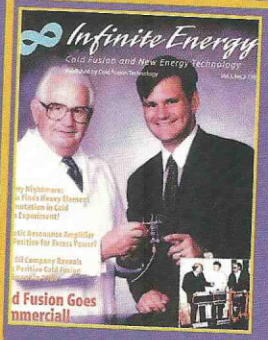

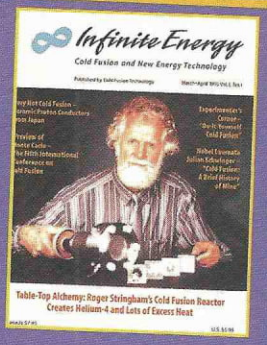

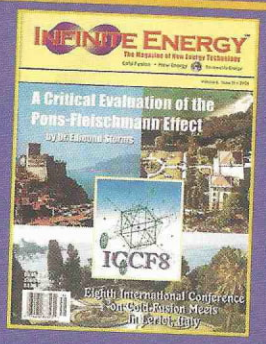

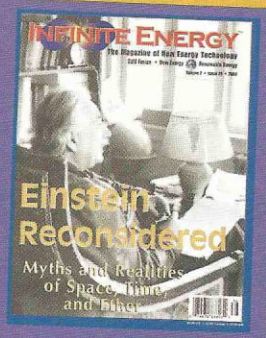

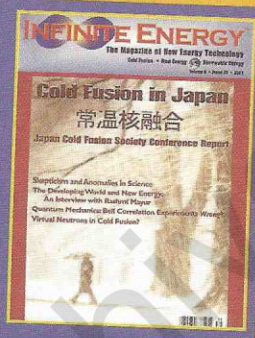

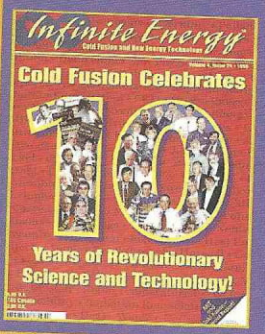

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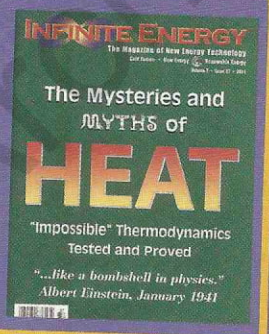

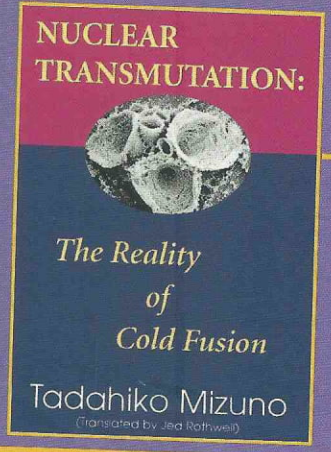

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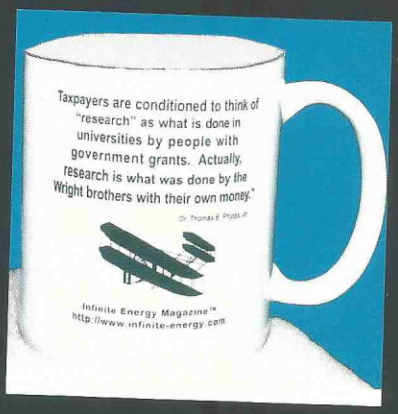

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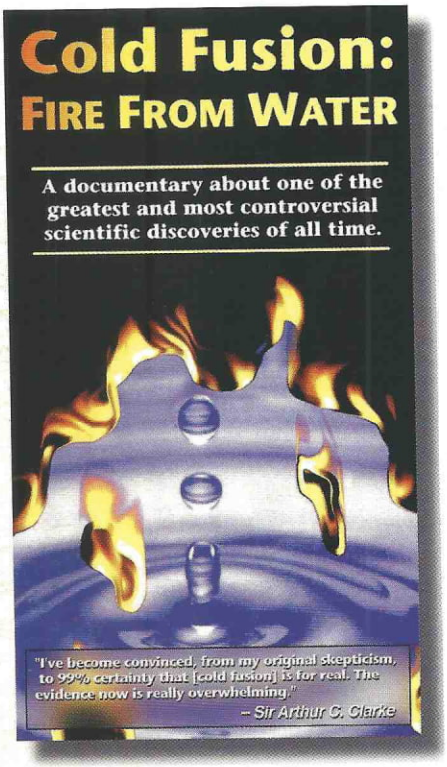

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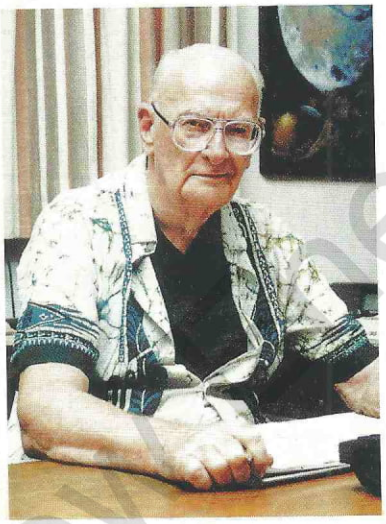

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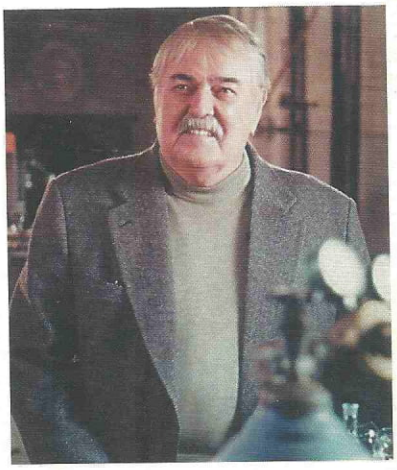

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